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Pacific Gas and Electric Magazine

Vol. IV

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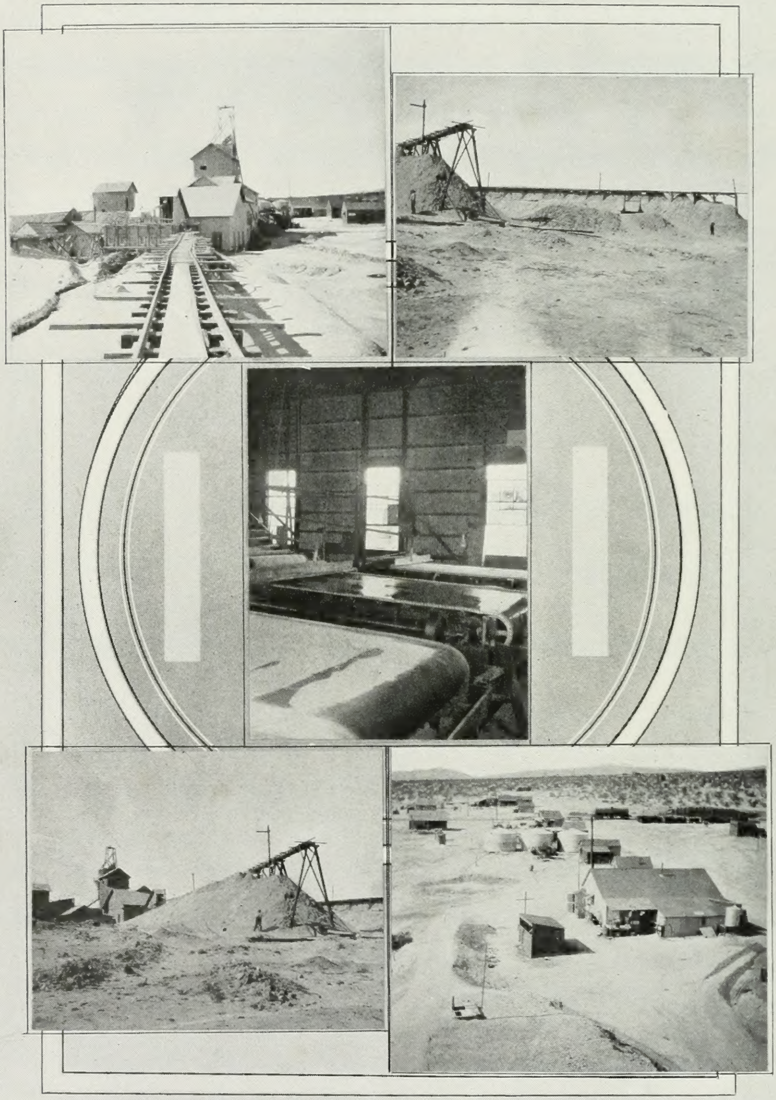


Atolia Tungsten Mines, San Bernardino County, California. Picture shows (1) Hoist and mill (2 and 4) accumulated tailing, (3) concentrator floor of mill, (5) water storage supplied by tank car.

PACIFIC GAS AND ELECTRIC MAGAZINE

VOL. IV JUNE, 1912 No. 1

Tungsten; What It Is, Where It Is Found and What It Is Used For

By E. C. VOORHEIS, Mining Operator, Sutter Creek, Cal.

In the accompanying article written expressly for the PACIFIC GAS AND ELECTRIC MAGAZINE, *Mr. E. C. Voorheis gives us the benefit of his great knowledge and experience in dealing with a subject which at the present time is of general interest. Mr. Voorheis is well qualified to write on the subject of tungsten, for in addition to being a mineralogist himself, he is one of the owners of the Atolia mine in San Bernardino County, which supplies the General Electric Company with large quantities of the precious ore that has given to the world the latest and best filament for incandescent lamps.* [ED.]

CALIFORNIA produces a great variety of minerals, including gold, diamonds and other gems, but of all the various minerals and ores which occur in the Golden State none are of greater interest than the ores of tungsten.

Tungsten has long been known to mineralogists, but the layman has only become familiar with it within recent years. It is a metallic element. It does not, however, occur in a free state, but always in combination with some mineral substance. It is found in combination with oxygen as tungstite; with calcium as scheelite; with iron as ferberite; with manganese as hubernite, and with iron and manganese as wolframite.

TUNGSTITE occurs only in very small quantities, usually being found in traces with the outcrops of bodies of other ores.

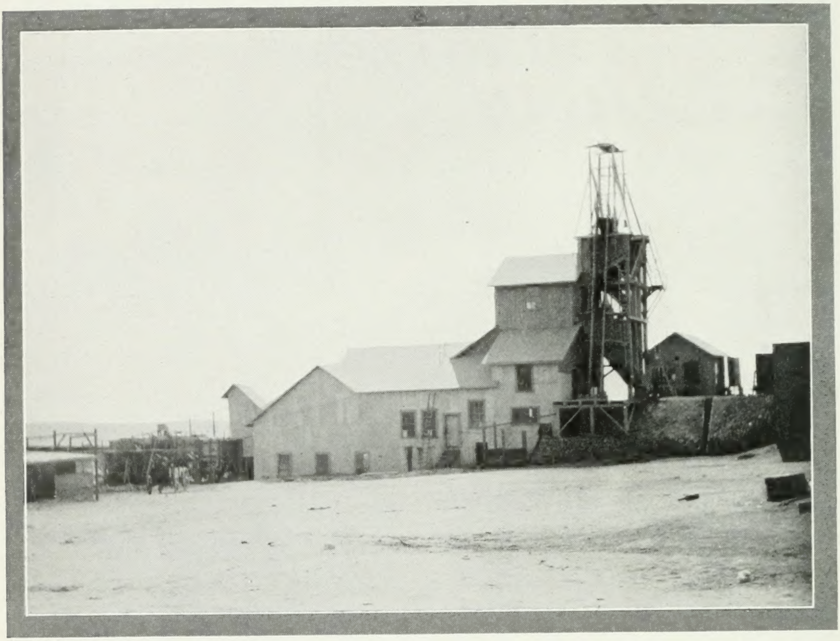
SCHEELITE is a tungstate of calcium (lime), and is one of the rarer ores. It is found mixed with the ores of bismuth, molybdenum and antimony in Australia, and, in small quantities, in other places. California enjoys the distinction of having a deposit of this ore which is unassociated with other metals, and for this reason is in great demand and is called standard quality of tungsten ore.

FERBERITE is a tungstate of iron and is the form in which most of the tungsten in Colorado is obtained.

HUBNERITE is a tungstate of manganese and occurs in scattered bunches throughout the Western States. It is not produced in any great quantities.

WOLFRAMITE is a tungstate of iron and manganese and varies in composition between ferberite and hubnerite. It is the most commonly known ore of tungsten.

These ores differ in appearance. Wolframite and hubnerite are dark brown to



Mill at Atolia Mine, San Bernardino County, and Hoist.

nearly black, while scheelite is white or grayish white to yellowish, sometimes dark gray. The chief physical property of these several ores is their great density, their unusual weight always attracting the attention of anyone who chances to find a piece while prospecting. The first two—that is, wolframite and hubnerite—are often mistaken for iron ore, but no iron ore is as heavy as either of the ores of tungsten when pure. Of the three, wolframite is the heaviest, having a specific gravity (density) of 7.2 to 7.5, whereas that of metallic iron is but 7.3 and that of hemantite 4.9 to 5.3. Hubnerite has a density of about 5, and scheelite 5.9 to 6.1. Thus, it will be seen that the tungsten minerals are all of unusual weight for their bulk, as compared with other common minerals, such as quartz which has a density of only 2.65.

Tungsten ore is mined and shipped from a great many countries, but the principal supply comes from Queensland, Portugal, Argentina and the United States. The ore is not uncommon, though tungsten is known as one of the rare metals. Deposits that can be worked at a profit, however, are very unusual. The ore almost without exception occurs in such rocks as granite, and even then under conditions which indicate that its deposition has been due to exceptionally high temperature and great pressure.

To obtain the metal from the ore, much higher temperatures are necessary than can be obtained in ordinary furnaces such as are used for the reduction of lead, copper, zinc, tin and iron. For this reason, it was not until it was found possible to obtain the requisite high temperatures by means of the electric current that tungsten metal could be produced in commercial quantities. Because of the necessity of obtaining high temperatures and having to economize in bulk, the makers of tungsten metal require the purest possible ore and usually demand a guarantee of at least sixty-five per cent tungstic oxide.

This metal was first discovered in 1781 and was named after the Swedish word "Tung," which means heavy, and "Sten," meaning stone: heavy stone.

It might not be amiss in this article to relate a story that is told about this metal and how its qualities for hardening steel were first discovered. The author does not vouch for the truth of the story, although it is going the rounds.

A Swedish master of a sailing vessel was wrecked in one of the northern latitudes of Sweden, and it was necessary for his blacksmith to weld a piece of steel. In order to weld steel, it is necessary to have either borax or silica added to the parts to be welded, so that when it is hot enough, it will cause the metal to flow. Not having any silica or borax handy, the blacksmith sent a sailor ashore to pick up a piece of quartz, and when he had obtained what appeared to be suitable to his purpose, he proceeded to pulverize it for use in making the weld. But when the weld was completed and the blacksmith attempted to file or dress up the parts welded, he encountered a substance so hard that no file nor chisel nor any tool that he had would make the least impression upon it. The master of the vessel thought that very strange, and being of an inquisitive mind, kept the quartz sand which he had pulverized from the pebble picked up by the sailor, and took it back to Sweden.

The pebble the sailor had picked up was very heavy and was called in Swedish "heavy stone." Being given to a chemist for examination, it was discovered to contain tungstic acid. In all probability it was that element which had hardened the steel.

The principal use of tungsten is to harden steel, and the tool steel of the present day is nearly all tungsten steel, having from eight to twenty per cent metallic tungsten mixed with the steel in its manufacture. It is called by some "self-hardening steel;" for the reason that the steel does not have to be tempered, because, with the addition of the metallic tungsten, it tempers itself. When heated to a cherry red and allowed to cool, the steel attains its maximum hardness and can be used by machinists for lathe cutting tools or for drills; and all kinds of machinists' tools can be run at a much greater speed and can do four times the work that can be done with ordinary steel, simply because the machine can be run four times as fast and not take the temper out of the steel, as the temper is not drawn when the tool gets very hot like it is in ordinary steel.

The saving effected to the consumer in the use of tungsten amounts to several hundred million dollars per annum. A specific instance is mentioned by Mr. Hess of the United States Geological Survey, who states that the president of one of the large automobile manufacturing companies advises him that if there were no such thing as high-speed or tungsten steel, the cost of each automobile would be $200 higher.

Dr. W. R. Whitney, of the General Electric Company, estimates that the saving to the consumer in the introduction of tungsten lamps is about $240,000,000 per annum.

Tungsten and its salts are used for making silks and cotton fabrics fireproof; for winding electric furnaces, and for use in the apparatus employed for the utilization of Roentgen rays. They are used also in the manufacture of silk for ladies' garments, to add weight to the fabric, as silk is sold by the pound and the heavier the manufacturer gets it the more dollars he gets for the article.

A number of years ago the writer was in conversation with Mr. Poyen, who was the head of the Brooklyn Chrome Steel Works. He had been making some successful experiments in the use of wolfram in the manufacture of steel. At that time it was very hard to obtain this ore. What he had purchased,

he had obtained from a small concern in the (then) territory of Arizona. One day he set out for California, and on the way he thought he would visit the mine and see to what extent the ore existed and whether he could count on getting a regular quantity sufficient for his requirements. On the journey from New York to the Pacific Coast in the same car with him was a young man from New York. They became car acquaintances and chatted over matters. As they came further west, they still remained in the same car, and when the time came to change cars to go into the territory of Arizona, near where this ore was being mined, the young man followed Mr. Poyen to the same place, and when asked what his business was there, he replied that he was looking after some wolfram.

Then the old steel manufacturer began to wonder, for the young man told him that he represented a silk house in the East. He asked him what he wanted of wolfram in the manufacture of silk when its principal use was the hardening of steel. The young man confided to him that, owing to its great specific gravity, wolfram was used to mix with the warp in the manufacture of silk to add weight to the fabric after it was woven and, also, to give it a stiff effect so that the silk would stand alone. Then Mr. Poyen understood.

Germany is probably the largest consumer of tungsten ore. Most of it is used by the Krupps, although the domestic uses of the metal are exceedingly limited in Germany as compared with its use in England and the United States, which countries probably consume two-fifths of the total production of the world.

As I have stated already, the metal is chiefly used for hardening steel, but its use is generally increasing in various other applications, and of late more particularly in making the filament for incandescent lamps. The following is from Consul-General Robert F. Skinner, Hamburg, Germany:*

INCANDESCENT LAMP FILAMENTS

"Wolfram lamps are electric incandescent lamps consisting in part of threads made of tungsten metal. Different methods are employed in their manufacture. Bluecher's

Handbook of the Chemical Trades thus describes the process:

"'The metallic wolfram, or tungsten, used in the form of threads in incandescent lamps, is obtained from wolframate. Wolfram acid (wolfram trioxide WO_3) is imported into the United States for the manufacture of these threads. WO_3 is obtained from wolframate by heating together finely ground wolframate and HC^1 (hydrochloric acid); thus oxide of wolfram and soluble chlorides of Fe (iron) and Mn (manganese) are formed. The three products are carefully washed about a dozen times with water. They are then allowed to precipitate, when the water is again drawn off and fresh water added. The precipitate of wolfram oxide is dissolved in ammonia, whereby ammonium wolframite is obtained. This is filtered and heated and finally boiled together with HNO_3 (nitric acid) to remove the iron and manganese.

"'Wolfram acid is obtained from thoroughly washed ammonium wolframate by heating it to a glowing point. This result originated in the manufacture of metallic thread, according to Dr. Auer's method (Osram lamp). He removes the oxygen and thus obtains metallic wolfram, which is mixed with an agglutinant and forced through fine diamond matrices. Drs. Just and Hananan apply the method of substitution. Kuzel applies the colloid process, according to which the metallic wolfram is alternately treated with strong boiling acids and with alkalies. It is, of course, thoroughly washed each time until it is converted into a colloid. The colloid is then precipitated, the liquid drawn off, and the residue, which is gelatinous, is forced through the diamond towel. Lamps furnished with these threads are called Kuzel lamps.

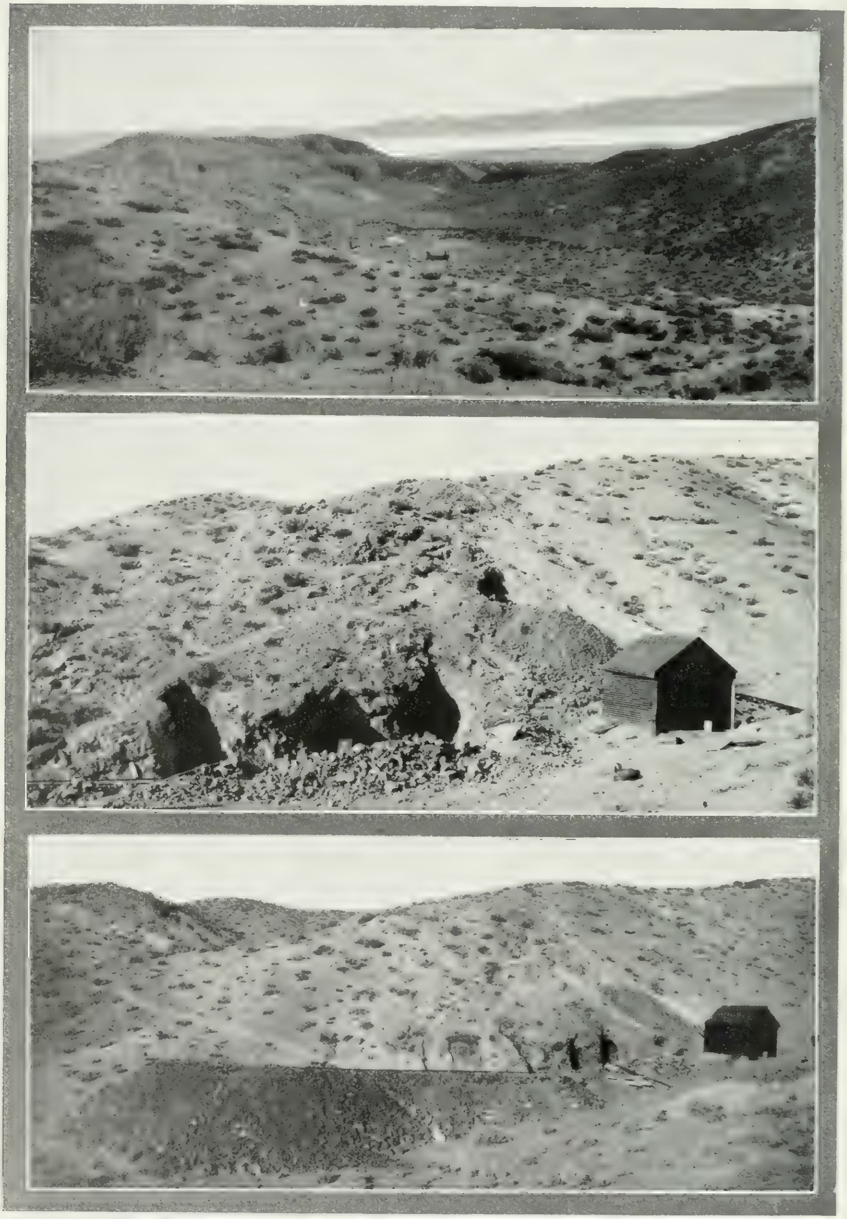
ADVANTAGES OF WOLFRAM THREADS

"Another method for the production of colloidal wolfram is to send an electric current under water through two electrodes made of metallic wolfram. In this way, small particles of wolfram are thrown off from the electrodes and form colloidal wolfram. The products of the three methods are of equal value. The wolfram thread coming out of the matrix is dried in an oven and then heated in an electric oven up to 2,000° C. to drive out the volatile ingredients. Then an electric current is allowed to pass through the thread in an atmosphere of indifferent gas, and the thread for the lamps is thus obtained.

"The current consumption of the wolfram lamp is from 1 to 1.3 watts per Hefner candlepower, whereas the carbon-thread lamp consumes 2.3. The disadvantages are higher prices and greater fragility of the thread. Against this, the wolfram thread has a longer life (1,000 burning hours against 450 of the carbon thread lamp), and it is also much less sensitive to current fluctuations. The wolfram light also gives a better light."

This is a brief outline of how the pressed tungsten filament is made and used in Germany. In the United States, both the General Electric Company and the Westinghouse Company have far improved upon this method of making tungsten filaments, and it is an achievement much to the credit of both the Westinghouse and the General Electric companies and is the result of strenuous scientific investigation by the best talent that could be employed. By the method discovered by the General Electric Company, it is possible to draw tungsten metal into a wire as fine as one-thousandth of an inch in diameter so that the wire is tough and pliable and can be wound upon spools like sewing thread. It is used in one piece in the lamps and is not so fragile and does not break so easily as that produced by the method used in Germany. The tungsten wire, as drawn out for this purpose, is very strong, having much more strength than any steel piano wire that was ever made. It is estimated by the General Electric Company that the strength of this tungsten metal would be equal to 500,000 lbs. to the square inch. The specific gravity of tungsten metal, as given by the General Electric Company, is 19.12, while that of gold is 19.3, showing that the metal is very nearly as heavy as gold.

To give a little idea of the rapid advancement in the use of tungsten in the works of the General Electric Company is told better by the purchase of the tungsten ore by this company from the Atolia Mining Company,



St. Anthony Tungsten Mines, near Lovelock, Nevada. Views present, in order, Humboldt Sink, Main Tunnel, Ore Dump.

whose mines are situated in Kern and San Bernardino Counties. The first purchase made by the General Electric Company, in 1910, was 1000 pounds of scheelite ore. Six months later they purchased 2,000 pounds for further experiments. Six months later they ordered 10,000 pounds, and in December, 1911, they ordered 60,000 pounds, which covered a period of a year and a half for them to perfect a way of reducing the scheelite ore to malleable tungsten. The process they use they guard very carefully, and no one is allowed to know anything about it.

The discovery of this metal for making filaments is a great advantage to the light consumer, as the consumer can obtain two or three times the quantity of light at about one-half the consumption of electricity. It is estimated in some instances that an increase of one thousand per cent in value to the consumer is obtained by the use of tungsten lamps, as, in 1885, with the old carbon lamp with a rate of 25 cents per kilowatt hour, you could obtain 800 candle hours, but in 1911, with a rate of 10 cents per kilowatt hour, the lamp efficiency is increased to 8,000 candle hours.

Popular delusions in regard to tungsten may be worth dealing with here. It is not used in the manufacture of armor plate, for, while it makes steel hard, it does not make it tough; neither does it improve the quality of the steel in a general way, since it tends to make it brittle as well as hard. The most general delusion in regard to this metal, however, is that a deposit of the ore is as good as a fortune. The prospector usually picks out a crystal of pure wolframite or scheelite and has it assayed and finds it contains a large percentage of tungstic acid, which is worth over $500 per ton. Unfortunately, the next crystal is usually a long way off, and when you begin to mine it on the ground, the costs run up very high and it takes a very large average percentage to make a mine profitable.

The scheelite ore from the Atolia mines is shipped to all parts of the world, principally to the steel manufacturers, and the product of these mines (scheelite) is now considered the standard quality of tungsten ore, as it runs higher (sometimes over 72 per cent tungstic acid) than the product of almost any other mine in the world.

The ore was first found on the desert of San Bernardino County, not far from the town of Randsburg, in the form of float. It being a very heavy stone, attracted the early prospectors and they found, by sending samples for analysis, that it was scheelite and contained tungstic acid, from which metallic tungsten is produced.

After tracing up the float which was found on the surface of the desert, small veins were found and prospect shafts were sunk at different points. The formation in which they occur is granite, both walls being granite. Usually a seam of quartz is first found which the prospector calls "bone," and the detection

of the scheelite that is contained in the "bone" or quartz is done in the same manner that a prospector would prospect for gold, by the pulverizing and panning out process. We crush the quartz or "bone," and if any scheelite is present it is so heavy that it hangs back in panning out, just as particles of gold would. These little veins are traced from the surface down and are found on the surface by digging trenches across the general formation of granite in which they occur. Usually the lenses are small, and it is very expensive to produce ore from the ground, owing to the great amount of exploration necessary to find them. The size of the vein is from a few inches up to a foot and occasionally eighteen inches in thickness.

The Atolia Company has sunk a great number of shafts on its property at different places, using gasoline for power, and the ore is mined in the same manner as for other precious metals. From the different shafts it is hauled to the mill, which is a Huntington Mill, and the ore is crushed as you would crush gold ore, with water, and the pulp, after it has gone through the mill, is run over Frue vanners and the scheelite concentrated in the same manner as sulphides are from a gold mill. The concentrates are then taken out and dried over a furnace and sacked in heavy canvas bags for shipment, about one hundred pounds in a sack. All of the water used in milling at Atolia has to be hauled in on the cars, which makes it a very expensive item. Any miner would understand what a large amount of water it must take to run a stamp-mill, and the Huntington Mill in use at Atolia would probably be equal to a five-stamp battery.

I have stated that the process of reducing the ore to metallic tungsten is a secret and very few know or understand how it is done. In the United States, very few people are familiar with its reduction. First they produce the tungstic acid, which is a lemon-colored powder of a very heavy specific gravity. That is made into metallic tungsten by a chemical process, and metallic tungsten is a precipitate, fine, like flour, with a steel-gray color. In this form it is added to the steel furnace in percentages according to the amount required for the different hardness of steel to be manufactured. The metal when melted into bars is susceptible to a very high polish. It is very hard and very brittle when in the pure state. It fuses at a very high temperature, but is easily manipulated with the electric furnace.

The tungsten tool steel is susceptible of being forged into shape by a blacksmith, but it requires very heavy hammers to make any effect on it, as was discovered at the Pacific Gas and Electric Company's plant at Electra. It being found necessary to cut off a piece of the revolving part of a generator, which was about two inches thick, of cast iron, the work having to be done with the generator in place as it could not be removed, the question arose, what kind of a tool could they get to do this work? It was decided to get a bar of tungsten steel, the size of the bar, I think, being one inch by two and one-half inches. From this bar they tried to forge the cutting tool to do this work, and, as I understand it, they worked two or three days at the blacksmith shop at Electra, with three hammersmen with 14-pound sledges, and could not make any impression upon the piece of steel that was to be forged. Later they took it to Garbarini's shop at Jackson, where he had a small power hammer, and there they were able to forge the tool to do the work, and this one tool did all of the work for the four machines they had to change.

We are all looking forward to the time when tungsten will be much more sought for than at present, for, with the advance of electrical science and the electric furnace, no one can now tell or even conjecture what beneficial results may be obtained from this valuable metal.

Line Construction Men are Nomads

They lead a breezy, wandering life in the open-air. How "Pacific Service" equips their camps

By WILL. T. JONES, O. & M. Department.

Will T. Jones

In an enterprise of the comprehensive magnitude of the Pacific Gas and Electric Company, it goes without saying that an important feature of its working organization is the Line Construction Department. This consists of a force of about one hundred and fifty men, whose duties carry them to all points of the compass within the vast area covered by the company's hydro-electric system.

It might be said these men have no homes. It is true that they have very little opportunity to taste the sweets of domestic ease. They are, in fact, a nomadic tribe, always on the move and resting where they may. Their main duty concerns the company's pole lines. Say, for instance, that the company enters into a contract with a consumer who desires electric power to be served to him at some remote point, far away from anywhere. It might be necessary to build ten or twenty miles of pole line to accommodate this one consumer; yet under the terms and conditions of "Pacific Service" this is readily done. Here the Line Construction Department comes in, and as the towns in California as a rule are far apart, it has been found absolutely necessary, from an economical standpoint, to set up camps at various points along the proposed routes in order to house and feed the men during the work of construction.

Line construction men in camp at Woodland, 1912.

It is with this camp-life that the present article has to deal. It may interest some of the readers of this magazine to know just what is required in the way of camp equipment, how the men live, and, in general, what it means to send out a corps. Beginning with equipment, the following list is given for an outfit of twenty line construction men and an occasional guest or two:

1	Mississippi range No. 26 S
6	Joints of pipe for same
1	Kitchen tent, 16 ft. x 18 ft.—5 ft. wall.
1	Dining tent, 16 ft. x 18 ft.—4 ft. wall
3	Sleeping tents, 16 ft. x 18 ft.—4 ft. wall
1	Office tent, 10 ft. x 12 ft.—4 ft. wall
1	Fly for tent, 16 ft. x 18 ft.
22	Iron cots, 2 ft. 6 in. size
4	Camp stoves with pipe
1	First-aid cabinet
1	Retinned stock pot, 5 gal.
1	Heavy drip pan, 21 in. x 22 in.
2	Drip pans, 12 in. x 20 in.
1	Hotel colander
1	Butcher cleaver
3	Large tin dishpans
1	Coffee pot, 5 gal.
1	Tea pot, 5 gal.
2	Tea pots, 2 qt.
2	Coffee pots, 2 qt.
2	Fry pans, 13 in. diam.
3	Twelve-cup muffin pans
4	Wash basins
1	Straight pot, 3 gal., with cover
2	Sauce pans, 2½ gal.
2	Sauce pans, 2 gal.
4	Cold Blast lanterns No. 2, complete
2	Milk pitchers, 1 qt.
2	Water pitchers, 1 gal.
4	Platters, oval, 14 in.
2	Milk pans, 8 qt.
2	Mixing bowls, 12 in.
3	Molasses jugs
4	Soup Ladles
4	Round pudding pans, 3 qt.
3	Basting spoons
2	Cake turners
1	Universal food chopper No. 3
1	Pan flour sifter
1	Roaster, 13 in. x 20 in. x 9¼ in.
3	Galvanized water buckets, 4 gal.
1	Wash tub
1	Wash board
1	Heavy potato masher
1	Egg whip
1	Nutmeg grater
1	Cheese grater
1	Can opener
1	Butcher saw, 24 in.
1	Butcher's steel
2	Small table lamps, complete
1	Wood rolling pin
3	Meat forks, 3-prong
2	Skimmers
6	Pot brushes
25	Dinner plates, 9 in.
25	Soup plates,
25	Saucers
25	Cups
2	Sugar bowls
2	Butter dishes
4	Salt shakers
4	Pepper shakers
12	Vegetable dishes
12	Tin pie plates, 9 in.
2	Butcher knives, 10-in. blade
1	butcher knife, 8-in. blade
1	Kitchen knife
25	Table Forks
25	Table knives
25	Table spoons
25	Tea spoons
2	Acme Lanterns No. 01.
1	Coffee strainer
1	Meat safe

In the above list of equipment it has been found that white enamel ware gives the best satisfaction. It must be remembered that it is necessary to move camp about once a week as the line work progresses, therefore everything must be light and still unbreakable, if possible. In addition, it is sometimes necessary to move a camp from one job to another a distance of 100 miles or more, so lightness and durability must again be considered.

Camp near Knight's Landing.

Camp near Woodland, 1912. Dinner time.

Each sleeping tent provides for eight men. A camp stove is furnished in each tent, as it very often happens that the line work extends well into the winter months and so every thing is done to make it as comfortable for the men at night as is possible. The picture shows one of the tented cities that was nestled under the branches of a large oak tree near the town of Knights Landing in Yolo County.

Having provided the camp equipment complete, it is necessary to provide the eatables. A great many things have to be taken into consideration in furnishing a moving camp with groceries and provisions. It is absolutely out of the question to provide large quantities of the varions articles needed, as the cost of transporting them from one place to another would greatly increase the cost per meal. Then, again, there is no way to care for meat, butter and like perishables, so these have to be purchased in small quantities and often.

It is the aim and object of the Company to make the boarding-house self-supporting. The men are charged 25 cents per meal, and every endeavor is made to keep the cost down to that figure. To do this requires careful management by the cook, as the crew is constantly changing in numbers, and the lost time in moving enters into consideration.

Men doing line construction work, like all other outdoor work, have as a rule, healthy appetites, and it is a pleasure to see them with a contented look on their faces after

Kitchen and dining tent.

Erickson, cook; Coghlan, timekeeper.

Sam, the cook, making bread.

supper. As a sample of what is given them in the way of "Pacific Service" for the inner man, I am giving herewith a sample bill of fare for a day:

BREAKFAST

Mush, coffee, fried potatoes, eggs with steak, bacon or ham, light bread or hot rolls and hot-cakes.

DINNER

Roast beef and beef stew, potatoes, macaroni and cheese, beans, two kinds of vegetables such as corn, string beans, peas, cabbage, carrots or turnips, pie or pudding, and tea.

SUPPER

Usually the same as dinner, with fruit in the place of pie or pudding, and in addition boiled rice, and cake.

With each meal they have butter, syrup, sugar, milk, etc., and occasionally salad.

While the above might not seem as palatable as some of Mrs. H. Rose Stewart's recipes, still the number of complaints in regard to the culinary department are very few.

The following list of groceries will be sufficient to feed a crew of twenty men for thirty days, and while all cooks differ in regard to actual quantities of the various articles of food they use, it will be found that the items below will, generally speaking, give entire satisfaction:

600	lbs. White Flour
10	lbs. Cornmeal
200	lbs. Sugar
50	lbs. Small White Beans
75	lbs. Butter
50	lbs. Macaroni
3	cases Tomatoes (gal. tins)
3	cases String Beans (gal. tins)
1	California Cream Cheese, 23 lbs.
3	Hams, about 14 lbs. each
40	Bars Savon Soap
50	Bars Ivory Soap
10	Cases Evaporated Milk
32	oz. Lemon Extract
60-lb.	Drum Ground Coffee
3	1-gal. jugs Catsup
50	lbs. Table Salt

Getting ready for the evening meal.

A line-up after supper.

1	gross Safety Matches
5	lbs. Shredded Cocoanut
10	lbs. Raisins
1	lb. Ground Ginger
25c.	Yeast Cakes.
5	lbs. Baking Powder
1	lb. Baking Soda
10	lbs. Cornstarch
1	case Eggs
1	50-lb. sack of Whole Wheat Flour
2	cases Wheat Flakes
50	lbs. Bayo Beans
6	sacks Potatoes
50	lbs. Lard Compound
50	lbs. Rice
45	lbs. Mincemeat
5	gals. Pickles
6	sides Bacon
25	lbs. Dried Prunes
25	lbs. Dried Peaches
2	¼-cases Soda Crackers
5	gals. Syrup
32	oz. Vanilla Extract
5	lbs. Tea, Green or Japan
3	cases Sugar Corn
1	lb. Black Pepper, Ground
5	lbs. Ground Chocolate
10	lbs. Currants in Bulk
1	small can of Cinnamon
1	" " " Cloves
1	" " " Nutmeg
1	" " " Mace
1	" " " Allspice
1	" bottle Curry Powder
1800	pounds of Beef.

One of the principal articles of diet in a camp and the one that really does most to satisfy men in regard to the meals served, is good bread. It is generally the best policy to let the cooks have the particular brands of flour that they favor, in order to get the best results in this line. An accompanying illustration shows one of the tent kitchens with dining-room attached. The large figure in the background is "Sam," the colored cook, making his daily batch of bread. Sam is famous for his bread and inherits that natural tendency from a race of good cooks.

Three parts of good conversation consist of good manners.

E. F. Benson.

John Jones and the Hero

John Jones walked from his home at morn
And thanked his stars that he was born
To live in realms of perfect peace,
Protected by the grave police.
He took a trolley car downtown
  And on that twenty-minute trip
Knew not that he was riding down
  Through clouds of germs that bring la grippe.

John Jones walked for a block or two
As most of us must daily do.
And as he swiftly onward sped
A ten-ton safe swung o'er his head—
If it had dropped, then this had been
  A verse that ends with R. I. P.
But Jones went on with cheerful grin;
  The safe swung from a rope, you see.

John Jones sat at his desk and worked
And knew not that about him lurked
Pneumonia germs and other ills
Upon the old one-dollar bills.
John Jones went out to get his lunch,
  And while he scurried through the street
To get the sandwich he would munch
  A thousand dangers dogged his feet.

John Jones went home, and on his way
An auto tried John Jones to slay;
He heard its toots and honkings wild
And jumped ten feet and gaily smiled.
And once the car that John Jones took
  Went whizzing o'er a railroad track
A train was coming; no one shook
  With fear that they might get a whack.

John Jones that night went out to hear
A lecturer who knew no fear—
A man who'd trudge through ice and snow
With mercury 'way down below
To find the pole; and Jones sat there
  And cheered that man, and said 'twas great
To see a man who did not care
  How often he was tempting fate.

Wilbur D. Nesbit.

Stubb—Who is the gentleman with the ear protectors? Is he a football player?

Penn—No; complaint clerk in the gas office.—Chicago News.

ITEMS OF GENERAL INTEREST

For the purpose of encouraging the better lighting of the stores and other places of business in San Francisco, "Pacific Service" has instituted a gas-arc campaign. Headquarters have been established at 1065 Mission Street, where W. T. Pease of the Appliance Department is employing ten salesmen, eighteen arc installers, and eighteen wagons to do the work of supplying the latest improvements in gas-illuminating apparatus.

Mr. Pease in reporting progress states: "We are putting out, on the average, seventy-five lamps a day, and have already installed over two thousand. In addition, we have taken over one thousand consumers' lamps on our maintenance service. We hold meetings every Friday evening, with an average attendance of about forty. Papers are read and a general discussion enjoyed. Our enterprise has caught on with the public."

The Pacific-Union Club has closed down the generating plant installed in its building on Nob Hill, and is now being supplied with electricity and steam from the Pacific Gas and Electric Company's lines and mains.

The plant at Sutro Baths, also, has been closed down, and a contract made with "Pacific Service" whereby all of the electric current used at the baths for power and lighting purposes will be taken from our lines. A description of the work of installation will shortly appear in the magazine.

From Marysville comes cheering news from Manager Poingdestre, who writes: "We are still adding to our day load, and hope before the season is ended to have one thousand additional horsepower in small motors ranging from five to twenty horsepower for pumping plants in Sutter and Yuba Counties."

Manager J. W. Hall, of the Stockton Water District, sends word that his district is engaged in laying thirteen blocks of 12-inch and 14-inch cast-iron water main from the water-tower on East Street to the business portion of the town for the purpose of giving better fire protection. The cost of the work will be about $18,000.

Under the direction of "Pacific Service," the city of Piedmont has just completed the installation of a system of red lights for police signal purposes. The installation consists of nine 60-watt Mazda lamps, placed on the hill tops where the night patrolmman can see at least one of them from any part of the city. The lights are enclosed in 12-inch ruby balls, and are very conspicuous. They are operated four in series on 220-volt multiple circuits, controlled from a switch in the fire engine house, the ninth light being on the tower at the engine house. The entire system was installed by the Distribution Department of the Oakland District and turned over to the city.

Manager Foster of the Marin District, the other day was the pleased recipient of a communication from a consumer who voluntarily signed himself "A Thankful Consumer." The communication, which is given here in full, speaks for itself:

"San Rafael, Cal., May 31, 1912.

"Pacific Gas and Electric Company,
"Attention Mr. W. H. Foster.
"San Rafael, Cal.

"Gentlemen: Enclosed herewith find my check for $25.00 in payment for bill for one No. 241 Reliable gas range.

"The courtesy extended to me in this matter is more than appreciated, and is in accordance with your advertisements which appear in the local papers, 'Pacific Service.' If all the public-service corporations were as considerate and as anxious to please its patrons as your company has been in this particular case and in cases in the past, the general public would not be so eager to condemn.

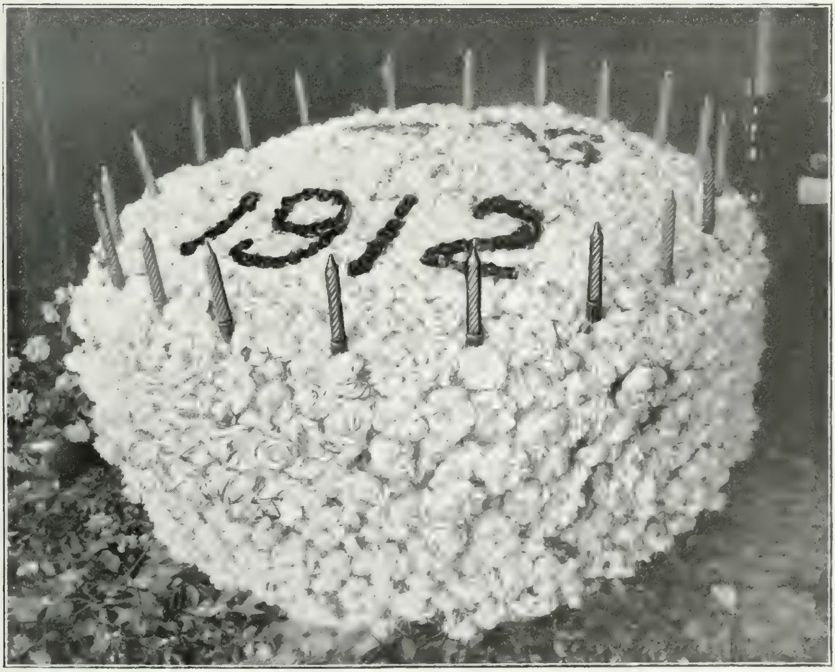
"Again thanking you for your kind attention, believe me to be,

"A Thankful Consumer,
"(Sgd) THOS. O'CONNELL."

"Pacific Service" came out strong at Santa Rosa during the Rose Carnival this year, which was held in the first week of May. Manager M. G. Hall had a most attractive window display which was the talk of the town. Its main feature was a mammoth rose cake four feet in diameter and eighteen inches in height. It was entirely covered with natural white climbing roses, and on the top the legend "1893"—"1912", marking the dates of the first and last carnivals held in the City of Roses, was set out in red rosebuds. Around the margin of the cake were twenty candles in the carnival colors, red, green and yellow. The whole was made to represent a birthday cake, and was particularly attractive at night when the twenty candles were lit and the soft light covered up any defects in the make-up caused by the withering of the fragile petals.

The window was draped with numerous sprays of China roses, and the floor was strewn with roses and rose branches. Manager Hall was fairly overwhelmed with compliments and congratulations for his enterprising ingenuity.

The accompanying illustration is from a photograph of the rose cake taken while the carnival was at its height.



Manager S. J. Lisberger, of the Department of Electric Distribution, announces the appointment of W. F. Blide as superintendent of the newly created Valley District, embracing the distributing districts of Chico, Marysville, Woodland and Colusa.

The following appears in The Progressiev Age of May 15th, 1912:

"A scale of prices for gas is one of the most interesting things a real gas man can employ his time with. Granting that profits should be divided between the investor, consumer and employe, which is a decidedly advanced way of looking at the matter, how can this three-legged demand be satisfied? What proportion should each receive? Should the investor's share be limited to 8 or 10 per cent dividends, or not limited at all? Should the consumer profit equally with the investor? If not, what ratio would be most equitable? Should the employe receive a greater or less share than either investor or consumer, and in what form should his participation in profits come? It is a problem full of intricate considerations and unsolved relations, and is worthy the steel of our best champions. The law of compensation is the underlying requisite of successful business. Make it worth the consumer's while to use more gas and he will do so; make returns from securities attractive and investors will run after them; put a premium on brains and labor and you can have the best on the market. Why not try it?"

Demonstration Car Still Running

Our Electrical Demonstration Car, which was described in the May number of the Magazine, is still on the road and continuing to attract crowds of admirers at every stopping place.

It is more than gratifying to note the cordiality with which the people of the Sacramento Valley greet this latest enterprise of "Pacific Service." It is estimated that about 4,500 people have visited the car since it started out on the 16th of April. The following excerpt from a letter to Manager S. V. Walton, of the Commercial Department, from Expert Killam, who is in charge of the car, will give some idea of how successful the experiment has been:

"I had a great surprise yesterday in attendance. After being in Pleasant Grove for about an hour and a half not a person had shown up, and there wasn't anybody in sight. All of a sudden there came a crowd about fifty strong in buggies, on horseback, afoot and in automobiles. Then about half an hour later about a hundred more came, bringing their lunches, and all sat on the grass in front of the car.

"Of course I was invited by the Marshal and Mayor to partake. Then after lunch I told some of the men I did not have any water for the pumps, so two of three of them went about a quarter of a mile for water, so I had everything in operation for about four hours. I entertained in all about two hundred people alone.

"They had a mass meeting in the town hall last week and decided to declare yesterday a holiday, so they closed up the town, also the school, and came in a bunch. So far everybody who has come in seems to have gone away satisfied. They all stand around talking about what they have seen for a long time."

At the time of writing, the car is making a second trip over the Northern Electric Route, covering much of the ground that was gone over the first trip. E. A. W.

Sam Davis on Electricity

Humorist's Tribute to the "Universal Agent" Ranks as a Classic Among Word-Pictures

Among the men whose names have gone down to history in connection with the romantic events of early days on the Comstock, Sam Davis, editor of the Carson Appeal, stands almost alone in his steadfast attachment to the sagebrush region, where he still resides.

His facile pen has sketched many a word-painting that will live in the memories of men. His "First Piano in a Mining Camp" occupies a permanent place in the Book of American Humor. We are indebted to the California Literary Club for the following excerpt from an address delivered by Sam Davis at a banquet at Virginia City upon the occasion of the installation of electricity on the Comstock. It will be new to most of our readers and, in any event, is worth reproducing, for truly it is a classic.

"Born from nothing, it leaps into existence with the full-fledged strength of a giant, dies, is born again; lives a thousand lives and dies a thousand deaths in a single pulsating second of time.

"It soars to every height, plunges to every depth, and stretches its vast arms throughout illimitable space.

"It plants the first blush upon the cheek of dawn; with brush of gold upon the glowing canvas of the west, it tells the story of the dying day.

"As its mere whim and caprice, a thousand pillars of light leap from the dark and sullen seas which surge above the poles, while from its shimmering loom it weaves the opalescent tapestry of the aurora to hang against the black background of the Arctic night.

"It rouses Nature from her winter sleep, breaks the icy fetters of the frost that binds the streams, lifts the shroud of snow from off the landscape, woos the tender mold and bids the birth of bud and blossom; dowers the flowers with perfume and clothes the earth with verdure of the spring.

"It rides the swift course of the storms that circle round the bald crest of old Mount Davidson; cleaves the black curtain of the night with simitar of flame, rouses the lightenings from their couch of clouds and wakes the earthquake.

"Beneath its touch, the beetling crag, which took omnipotence a thousand years to rear, crumbles into dust, the mere playing of the idle wind; it lays its hand upon the populous city with its teeming, restless multitude, and yesterday where stood the glittering spire, the shining tower, the frowning battlement, today the cold gray ocean rolls in undisputed might.

"It gathers the doings of the day from the four corners of the world, the tales of love and death, of fire and flood, of strife and pestilence, and, under eight thousand miles of shivering sea, whispers the babble of two hemispheres.

"It turns the wheels of peace where poor men toil, it helps the husbandman to plow and plant and reap his whispering grain.

"It rides the wings of war where brave men die, and when it stalks between contending hosts, exalts the kingly crest and helps an empire plant its flag of conquest.

"It glows in lonely attics where weary workers toil to earn their crust. It shines o'er scenes where feet of feasters tread the halls of revelry. It lights the mourners on their pathway to the tomb. It glares in haunts where jeweled fingers lift the cup of pleasure to the mouth of sin, 'mid the sobbing of sensucus music and flow of forbidden wine; and speeding on its way illumes the dim cathedral aisle, where surpliced priest proclaims the teachings of the Master and golden-throated choirs lift their hosannas to the King of Kings.

"It was the Maker's ally at the dawn of time, and when God from the depths of infinite space said, 'Let their be light," it sent the pulse of life along creation's veins, baptised earth's cold brow with floods of fire, and stood a sponsor of a cradled world."

All Aboard for Seattle!

By GEO. C. HOLBERTON, President Electrical Development League.

G. C. Holberton

As the June number of the Pacific Gas and Electric Magazine goes to press, we of the Electrical Development League find ourselves in the midst of great doings.

Things started moving Wednesday, June 5th, when the Red Special carrying the eastern delegates to the National Electric Light Convention arrived in San Francisco. On the train were many notables in our ranks, including Mr. Frank M. Tait, First Vice-President of the National Electric Light Association; Mr. Charles H. Hodskinson, Master of Transportation; President Murray of the New York Edison Company, and Mr. Joseph McCall, President of the Philadelphia Electric Company. A reception committee from our league met the delegation at Del Monte, and accompanied them to the city by way of the Big Trees in the Santa Cruz Mountains. Upon arrival our visitors were conducted in a procession of automobiles to their headquarters in the St. Francis Hotel.

The next day we took them over the site of the Panama-Pacific Exposition, and thence to the Cliff House, where we entertained them at luncheon. In the afternoon a string of automobiles was placed at their disposal to do shopping, sight-seeing, or anything else they pleased. That evening an elaborate banquet was given in their honor at the St. Francis Hotel, at which Mr. John A. Britton, Vice-President and General Manager of the Pacific Gas and Electric Company, acted as toastmaster and extended the hand of welcome to our guests in behalf of the Panama-Exposition Company and the Chamber of Commerce, as well as the Electrical Development League. Mr. Tait replied for the visitors, and Mr. Vogelsang, Chairman of the Public Utilities Committee of the Board of Supervisors, made a short address in behalf of the City of San Francisco. In the entertaining line local talent was provided in plenty, including a Chinese band of forty-five pieces, and each guest was decorated with a bouquet of flowers by Chinese ladies in native costumes.

Friday the delegates were taken to Mt. Tamalpais and given luncheon at the tavern at the summit, returning to San Francisco in time to catch their train for the north.

The "Golden Poppy Special" left for Seattle Saturday night, June 8th, with the California delegates. The rest of the story remains to be told.

Authorized Additions and Improvements

ALAMEDA COUNTY DISTRICT

Work has been commenced on the extension of our primary line on the Dublin Road, Castro Valley, for the purpose of taking on additional consumers.

MARYSVILLE DISTRICT

Eleven-kilovolt, 3-phase line has been extended to supply pumping service in District No. 10.

Work has been commenced on the extension of 11-kilovolt and 2300-volt lines in Sutter County to take care of additional pumping load in that vicinity.

Automobile has been purchased for the use of the Superintendent of Electric Distribution of the Valley District.

OAKAND DISTRICT

One 250-horsepower and one 150-horsepower boilers have been installed at the plant of the Oakland Hotel Company for use in connection with the Oakland steam heating distribution system.

Two electric trucks have been purchased for use in the Electric Distribution and Gas Meter Departments.

SACRAMENTO POWER DIVISION

Eleven-kilovolt line has been extended on the Folsom Road, near Manlove, for the purpose of taking on additional consumers in that vicinity.

SAN FRANCISCO DISTRICT

Additional 1,000-kilowatt motor-generator sets will be installed at Substation C and at Substation G in connection with the recent contract entered into with the City for the supply of power to the Geary Street Road, which will be operated as a municipal plant.

Additional automobile has been purchased for use of the Gas Department.

SOLANO DISTRICT

All flat-rate consumers in the towns of Suisun and Fairfield have been put on a meter basis.

All flat-rate consumers in the town of Winters have been placed on a meter basis.

The distributing system in the town of Cordelia has been reconstructed, and all flat-rate consumers placed on a meter basis.

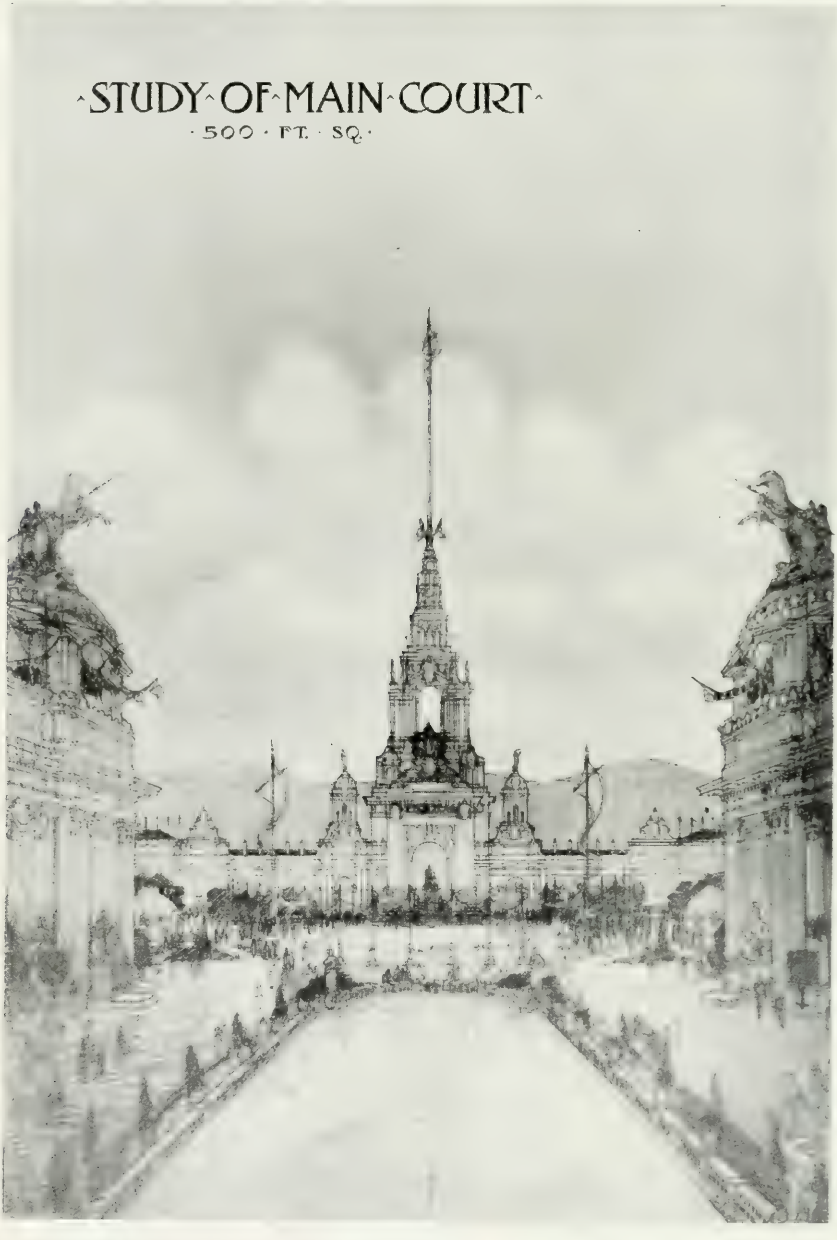
SOLANO POWER DIVISION

Eleven-kilovolt line has been extended from Woodland Junction to Willow Slough, to take care of pumping load in that vicinity.

Among its orders for railway power house and substation apparatus, the General Electric Company reports having received the following: Dallas Electric Lt. & Pr. Co., Dallas, Tex., three 500 kva. transformers; Worcester Consolidated St. Rwy. Co., Springfield, Mass., one 300 kilowatt rotary converter, 45 kva. reactive coil and switchboard; Manhattan City & Interurban Rwy. Co., Manhattan, Kans., one 200 kilowatt railway generator; Dallas Southern Traction Co., Dallas, Tex., four 350 kva. 33,000 volt transformers; the Pennsylvania R. R. Co., Philadelphia, Pa., signal apparatus consisting of eighty-two 6 kilowatt transformers, thirty-seven 1 kilowatt transformers and seven sectionalizing outfits for the stations at Wilmington, Del., and Lafayette, Pa.

The Portland Railway, Light & Power Company, Portland, Ore., will soon install new transforming apparatus in its stations consisting of six 750 kva. 11,000/2,400 volt units which have been ordered from the General Electric Company.

To make the world a friendly place, one must show it a friendly face.



Main Court of the Panama-Pacific Exposition, as suggested in a design by Joseph Pennell, the famous American artist.

Noting Progress of the World's Fair

AN event of the past month in World's Fair progress was the publication by the Exposition Directors of the ground plan of the site, including the proposed location and arrangement of buildings.

This calls for more than passing notice, as it presents to the mental vision almost a complete picture of the Fair City as it will appear in 1915. Its features include:

An esplanade on the water side of the grounds and along the north facade of the main group of buildings.

A similar open space with horticultural gardens on the south side.

A central tower at the south end of the main court, which extends north and south, from the horticultural gardens to the water esplanade.

Two lateral courts, parallel, and on either side of the main court, which, together with the east and west central way, divide the main group into eight principal buildings.

Sunken gardens, making a long court on the west side of the main group, with the Peace Temple at the south end and the California Counties Building at the north end.

On the east of this group, and extending to Van Ness Avenue, is the amusement concession space.

On the west side is the ground devoted to the buildings of States and Foreign Countries, with the United States Building controlling the group.

Beyond and toward Fort Point, is the maneuver ground and the stock exhibits.

There are to be three principal entrances. The main entrance will be located on Chestnut Street, at the south end of the main court. The water gate will be at the east end of the esplanade, with a ferry building and wharf space for small crafts. The third principal entrance will be on Van Ness Avenue, and leads through the concessions to the exhibition palaces.

Tearing down a landmark—the Fulton Iron Works.

Entering at the main gateway on Chestnut Street, the visitor will pass through the horticultural gardens and under the archway of the central tower, which is designated as the Administration Building, and into the main court, from the north end of which is presented the vista of the Bay and the Marin Hills. On the left are the Industrial Arts Building and one of the Agricultural Buildings. On the right are the Manufactures and Transportation Buildings. From the main court, which is the center of the scheme, the avenues of circulation are:

West, between the Liberal Arts and Agricultural Buildings into the west lateral court, and thence between the Education and Second Agricultural Building into the sunken gardens flanked on the west side by the Fine Arts Building, with the State and Foreign Country Buildings beyond; East, between the Manufactures and Transportation Buildings to the east lateral court, and thence between the Mines and Metallurgy and Varied Industries Buildings to the north-and-south avenue, flanked on the east by the Machinery Building, which serves as a screen for the gasometers, and passing around the south end of this into the amusement concessions; North, to the water esplanade, which extends between the facades of the main buildings and the Bay from the Ferry Building to the California Counties Building. Indenting this is the yacht harbor.

The esplanade will be planted with the hardier trees and shrubs, whose dark green foliage will be relieved with white stucco colonnades and architectural devices. The horticultural gardens, more protected from the winds, will be planted with tropical plants, amid which will be placed band-stands, restaurants and minor buildings, half concealed by the trees and flowering plants.

The entire site comprises 625 acres. Its maximum width is one-half mile, and its north and south length is over two miles, parallel with the Bay and the course of vessels entering the port.

The area of the principal buildings is given as follows:

	SQ. FT.
Fine Arts	170,000
Agricultural (two)	680,000
Education	225,000
Manufactures	276,250
Varied Industries	276,250
Liberal Arts	297,500
Machinery	425,000
Mines and Metallurgy	397,500
Transportation	385,000
Horticulture	255,000
Stock Yards	204,000
Stock Pavilion	85,000
Automobile Building	125,000
Total area	3,731,500

Sixty acres are reserved for the United States Building, parade ground and grandstands. Forty acres are designated for the State Buildings, and thirty-seven acres for the Foreign Buildings. Twenty lots, with a combined area of twenty acres, are reserved as a "safety factor." Forty-five acres are included in the amusement concessions. Of the general view of the Exposition, one of the architects says:

"The views obtainable of the entire site are varied, and if that looking east from the drive which skirts the hills in the Presidio be alone considered, the charm of this setting must be recognized as unique.

"The view embraces the Presidio as a foreground, its level spaces bordered by the dark masses of the eucalyptus and cypress, and beyond the hills of the city, a mosaic of color.

"Color will play an important part in the scheme—the broad general tones to give the necessary life and warmth to the walls, to enliven the surfaces in shadow, and to assist in obtaining a general harmony throughout the Exposition.

"Handsome mural decorations will be used in the sheltered surfaces, under the porticos and in the principal architectural motifs. Color is expected to add the necessary brilliance."

The general public interest in this proposed arrangement has been intensified by some wonderful work done by Joseph Pennell, the famous Philadelphia artist who came into prominence some years ago by being selected by James McNeil Whistler to write the story of his life and works.

Mr. Pennell was on his way back east from a trip to Panama, where he had been making a number of sketches for Century Magazine. While visiting San Francisco he was shown the ground plan of the Exposition site at Harbor View, and also some sketches in the rough of its many proposed architectural features. From these he executed about a score of beautiful etchings, presenting therein his ideas of the most important structures to be erected upon the Fair Grounds. They are certainly works of art, and have been on exhibition for some days at the Exposition Building in San Francisco, while copies of them have been distributed far and wide.

Return of Director Frank L. Brown.

One of these, generally conceded to be

the handsomest, is reproduced herewith. It is of the central structure in the group of Exposition buildings, the Main Court.

Another event of importance was the visit of Hon. Philander C. Knox, Secretary of State in the President's Cabinet, who was deputed by the President of the United States to attend the annual gathering of the California Development Board and, incidentally, to inspect the Fair site and acquaint himself with the progress made.

Mr. Knox's visit culminated in a banquet held May 7th in San Francisco, at which he spoke enthusiastically of the prospects for 1915. He expressed himself as delighted with the site at Harbor View, and before leaving he assured the Exposition Directors of the hearty co-operation of the administration at Washington in all they proposed to do.

Director Frank L. Brown returned the middle of the month from a three months' tour of Europe. He had a good deal to say about what he had learned abroad. In an open statement he advised publicity of the most candid description. He said he had heard complaints of the wholesale robbery of visitors to the various expositions in Europe, and he urged fair and reasonable treatment of our visitors in 1915 by railroads, hotels, restaurants and the like.

Mr. Brown suggested the organization of Boosters' Clubs throughout Europe, also of Travel Clubs, whose members should be pledged to make the trip to San Francisco in 1915. He urged the co-operation of insurance companies, banks, and shipping companies and firms having houses abroad. Last, but not least, Mr. Brown spoke for the American Merchant Marine, an institution which bids fair to be revived by the opening of the Panama Canal.

The Exposition Commission appointed by President Taft to visit the capitals of Europe and interest foreign governments in the enterprise, is making wonderful progress. Reports from England, France, Germany, Italy, Switzerland, Austria, and Russia all tell of the cordiality with which our men have been received.

It is interesting to note that Japan stands on record as the first of the countries to accept the President's invitation to participate in 1915.

Meanwhile numerous States in the Union have already selected their sites, including Oregon, New York, New Jersey, Missouri, South Dakota, Nebraska, Colorado, Utah, Idaho, Montana, Washington and Nevada. To these must be added the Philippine Islands. Next month the Cleveland Grays come here to select the site for Ohio. Governor Harmon has been sent a special invitation to accompany the expedition.

F. S. M.

Here Are Twenty Reasons for Using Electric Light

1—Safe.
2—Clean.
3—Bright.
4—Odorless.
5—Dirtless.
6—Greaseless.
7—Sootless.
8—Fumeless.
9—Flameless.
10—Matchless.
11—Heathful.
12—Convenient.
13—Explosionless.
14—Draws Trade.
15—Helps Advertise.
16—Signifies Success.
17—White Light.
18—Steady Light.
19—Always Ready.
20—Makes Home Attractive.

Cleverness is serviceable for everything—sufficient for nothing.

PERSONALS

With the opening of the current month came Mr. Samuel Insull of Chicago, President of the Commonwealth Edison Company of that city and a director of the Pacific Gas and Electric Company, as a visitor to San Francisco.

The purpose of his visit was to acquaint himself with the affairs of the great public-service system of the west in which he recently became a heavy investor and of which he was elected a director at the annual meeting of stockholders held in April last. He arrived June 1st and stayed with us a week, leaving on the evening of the 8th for Seattle in company with the California delegation to the National Electric Light Association Convention.

"Pacific Service" extended a hearty welcome to Mr. Insull, and on the evening before he left he met the company's Heads of Departments, District Managers and Division Superintendents at dinner at the Fairmont. He expressed himself delighted with his sojourn in the western metropolis.

"It is my first visit to San Francisco since shortly after the fire," he said. "I was curious to see how the town had recovered. I am delighted with its wonderful showing."

On the subject of "Pacific Service," Mr. Insull had this to say: "I was attracted to San Francisco as a promising field for investment, and as a result obtained an interest in the Pacific Gas and Electric Company. I feel that the men at the head of the company are well able to care for its interests."

Mr. Insull is one of the really big electric light men of the country. He has had a remarkable career. Born in London, England, fifty-two years ago, when a lad of twenty-one he set out to seek his fortunes in the New World, and came to New York to act as private secretary for Thomas A. Edison. Edison had implicit confidence in the young man's ability and judgment, so that for many years Mr. Insull had charge of the great inventor's business affairs and represented him in the organization and development of several of his electrical enterprises. He remained with Edison until 1892, when he resigned to take the management of the great Chicago corporation whose president he now is and which controls all the electric lighting business of the great city by the Lake.

Mr. Insull is a born organizer. He enjoys the reputation of captaining the best organized public-service corporation in the country, containing the best equipment of clever men, the most diversified, and doing the biggest business per capita. He is largely inteersted in the problem of supplying electric power to railroads, and made an address on that subject before the American Institute of Electrical Engineers last April. His remarks delivered on that occasion attracted widespread attention and were most favorably commented upon.

Wedding bells rang out in Stockton on the first of June for the nuptials of E. C. Monahan, Superintendent of the Stockton Power Division, and Miss Frances M. McInerney. We wish the happy couple long life and prosperity.

Don't forget the Suggestion Bureau! You may not receive immediate replies to the communications you send in, but that does not mean that they are either rejected or ignored. We invite suggestions from one and all. There is no system on earth so good as to have no room for improvement.

Pacific Gas and Electric Magazine

PUBLISHED IN THE INTEREST OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON - - - - - EDITOR-IN-CHIEF
FREDERICK S. MYRTLE - - - MANAGING EDITOR
A. F. HOCKENBEAMER - - - BUSINESS MANAGER

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

VOL. IV JUNE, 1912 No. 1

EDITORIAL

WITH THE PRESENT ISSUE the Pacific Gas and Electric Magazine enters upon the fourth stage of its endeavor in the field of instructive publicity.

It has not been, nor is it now in any sense of the word, a competitor of any of the various technical publications that enjoy circulation among the light and power interests of the country. It may be regarded rather as a companion. It originated from a desire on the part of the management of what is now known as "Pacific Service" to establish a monthly record of its activities and development, to which its employes should contribute and among whom it should circulate, as a means of fostering the "get together" spirit that makes for success in any field of enterprise. It has prospered to the extent that all over the Company's system each issue is awaited with interest, its features are discussed, its merits praised, its shortcomings excused. It has spread to the great world outside, also, and has found favor among business houses and men of prominence who are interested either commercially or personally in the development of the natural resources of our wondrous Golden State.

We may venture to claim, then, that the Pacific Gas and Electric Magazine fulfills the purpose for which it was ushered into the journalistic world. And so we present to our readers the opening number of Volume IV.

"Pacific Service" will supply power to the Geary Street Railroad in San Francisco. The Supervisors of that city awarded the contract to the Pacific Gas and Electric Company in open competition with the other power companies in the field. So "Pacific Service" will play its part in the initial experiment to be made by the western metropolis of a municipally owned and operated public utility. Concerning this, the San Francisco "Call" in an editorial says:

"The decision of the supervisors to buy electric power needed for the operation of the Geary Street Railroad is in conformity with the best judgment of the electrical experts."

The editorial refers freely to an address on "The Relation of Central Power Stations to Railways," delivered by Mr. Samuel Insull, of Chicago, President of the Commonwealth Edison Company of that city and a director of the Pacific Gas and Electric Company, at the April meeting of the American Institute of Electrical Engineers. "It is true," says the "Call" editorial, "that Mr. Insull's address dealt particularly with the electrification of steam railroads at terminals and under other conditions, but the question of economy in the purchase of power will apply with equal force to any form of electric railroad. In its summary of Mr. Insull's address the 'New York Commercial and Financial Chronicle' says:

" 'The principle underlying the economy is the greater and more efficient utilization of the energy which a central station plant must be capable of delivering, but which is now only fully (or approximately) employed at certain periods of the twenty-four hours to meet the varying demands upon it * * * The saving is effected by running under one system a number of operating plants * * * The diversity of demand is the fundamental basis in the profit-making of an energy-selling company. It is, therefore, advisable for electric railways operating in and around cities to consider seriously whether it is not cheaper to purchase their power from such diversity-using plants than to install their own plants on which heavy fixed charges must necessarily be fastened from the first.'

"That argument would fully justify the supervisors in their decision regarding the purchase of power for the Geary Street Railroad. The action of the supervisors seems plainly to be along the lines of economy and good judgment."

The voters of Vallejo have turned down a proposition to bond the city in the sum of $100,000 for a municipal light and power plant.

Two propositions were submitted on the same day, the other one being for a city hall to cost $125,000. It was observed that the lighting proposition suffered the more decisive defeat.

A pamphlet was circulated among the voters of Vallejo before the election. It was called "Plain Truth." On the lighting proposition it had this to say:

"The situation with regard to Vallejo on the question of electric lights is that there is already installed a complete plant which furnishes electric light and power to the city and to those of its inhabitants who care to use it, at what appears to be a fair rate. Besides the corporation which furnishes the current to the local electric light company, other producers of electricity in large quantities are spoken of as possible competitors in the local field. This may lead the people to think that cheaper electricity will soon be possible. But under the most favorable circumstances it cannot be said that that condition can profitably be taken advantage of by this city at this time.

"At the constitutional amendment election last October, the organic law of this State was so amended as to place in the hands of a Public Utilities Commission the regulation of rates to be charged by these large corporations furnishing a number of the cities and towns of the State with electric light and power. Prior to the adoption of this law there was no means of regulating those charges. The laws passed at the last session of the Legislature provide ways and means for carrying into effect the provisions of the recently adopted Constitutional Amendment and create a plan under which the Public Utilities Commission will operate, and which will rapidly be put into shape to make this legislation effective. But it will be some little time before it will be possible to make the necessary investigations and arrive at a basis on which rates charged by these wholesalers of electricity may be properly and equitably adjusted.

" No matter how rapidly they may attempt to solve the questions that may be presented it may be a year or more before we in Vallejo will be in a position to get the benefit of that regulation. Then, and not until then, will we be in a position, with definite information in our possession, to begin to figure with any degree of certainty on the subject as to whether or not it will be profitable or desirable for the city of Vallejo to go into the business of retailing electricity to its inhabitants.

"Considering that we have little or no accurate information on which to base calculations as to the future of this kind of business, does it not appeal to your common sense that it would be best to wait until the Public Utilities Commission has gathered together the data on which correct calculations might be reasonably founded, and until it has had an opportunity to investigate and to regulate and define the charges which the great producers of electricity passing through this vicinity may collect for their product, before we go into the electric light business for ourselves?

"With these facts in mind, it would appear that this is not the time to undertake the experiment of embarking in the electric light business so far as the city of Vallejo is concerned."

That this argument had weight with the voters on election day appeears to have been proven by the result.

What the Press Has to Say

"Pacific Service" Gets Contract

Will Supply Power to the Municipal Street Railroad in San Francisco

The city has decided to buy power for the Geary Street Road and to accept the bid of W. L. Holman & Co. of $337,100 for 43 semi-steel cars and four extra trucks for the municipal railway.

After a conference with the supervisors of the public utilities committee yesterday, the Board of Works decided to award the car contract Monday and at the same time to reject the bid of the Westinghouse Electric Company of $69,900 for the substation equipment, or transformer. The bid has been rejected because it has been found cheaper to buy power than to generate it.

The Pacific Gas and Electric Company, whose bid was the lowest of three submitted Friday, will be awarded the contract for supplying power for the municipal road. This contract, however, will not be awarded Monday. It is probable that it will be let at some time during the week after.

The Pacific Gas and Electric Company outbid the Sierra-San Francisco Power Company and the Great Western. The bid was 1 cent per kilowatt hour for direct current and .0085 for alternating current. It is pointed out that the company was able to set so low a figure because it will be able to sell the city its surplus power during the day when there is little drain on the company's store for lighting purposes.

The Board of Work's decision to reject the bid for the transformer equipment in the Geary Street carhouse is an evidence of the fact that the city will leave the entire duty of supplying power to the gas company. This will mean that the proposed power station at North Beach will not be built and that Supervisor Vogelsang's plan to make extensions of the Geary Street road, probably cross-town lines in Van Ness Avenue and Stockton Street, will be carried out.

The funds which were to be used for the power house and substation will be utilized for the extensions proposed by Vogelsang and other supervisors of the public utilities committee.

The plan to purchase current was launched first at a conference held recently between Mayor Rolph and the utilities committee. It was then decided to call for bids, and that if the figures showed that power could be bought for less than the city could generate it, such action would be taken.

San Francisco Call, May 19, 1912.

Samuel Insull in Town

Company's New Director Regards San Francisco as a Promising Field for Investment

Samuel Insull, President of the Commonwealth Edison Electric Company of Chicago and a heavy stockholder and director in the Pacific Gas and Electric Company, is in the city on his way to the annual convention of the National Electric Light Association in Seattle next week. Insull obtained his interest in the local company about a year ago, when he purchased 40,000 shares in it. Shortly afterward he was elected to the directorate. His visit to this city has no connection with the Pacific Company, he said yesterday at the Fairmont Hotel, and he will take no hand in its affairs while here.

"It is my first visit to San Francisco since shortly after the fire," he said, "and I was curious to see how the town had recovered. I am delighted at its wonderful showing. I was attracted to San Francisco as a promising field for investment, and as a result obtained an interest in the Pacific Gas and Electric Company. I feel that the men at the head of that company are well able to care for its interests and will not undertake to assist them."

He told of the benefit done Chicago by the advertising given it by the World's Fair, and prophesied that San Francisco would reap a similar good from the advertising being given it by the coming 1915 Exposition.

Insull first became identified with things electrical at the instance of Thomas Edison. When a young man Insull met the inventor, became a protege of his and gradually rose in his profession until today he is recognized as one of its dominant figures.

San Francisco Chronicle, June 4, 1912.

Compliments the Management

Samuel Insull of Chicago, recognized as one of the greatest of electric power authorities in the United States, who was elected vice-president of the Pacific Gas and Electric Company recently, is staying at the Fairmont Hotel. It is his first visit to San Francisco since he became associated with Frank Drum and others in the local corporation. Discussing his visit, Insull said yesterday:

"I am going to look thoroughly over the properties of the Pacific Gas and Electric Company, which are being so ably managed by Mr. Frank Drum, otherwise there is nothing significant in my visit, which will last probably a week."

San Francisco Examiner, June 4, 1912.

Its Business Increasing

Sacramento, May 7.—The Pacific Gas and Electric Company has shown such a large increase in business over last year that the State Board of Equalization has assessed its corporation franchise tax at $27,000 more than was paid by the company last year, according to an announcement made today by the Board. Nearly all of the power companies in the State were considered by the equalizers today and a large number of increases in assessments made.

San Francisco (Cal.) *Chronicle*, May 8, 1912.

Call for Pacific Gas Stock

Of the 30,000 additional shares of common stock issued by the Pacific Gas and Electric Company two months ago, carrying the right of stockholders of record at that time to purchase at $60 per share, less than 900 shares remain in the hands of the coterie of bankers that took them over. This is regarded by the syndicate and by the corporation's officials as evidence of the stockholders' faith in the company, as well as assurance of the stockholders' appreciation of a bargain. On the day the new issue was announced the stock was quoted at $65\frac{1}{2}$ to 66. Its quotation yesterday was $65\frac{1}{4}$ to $65\frac{1}{2}$. The right of stockholders to purchase the new issue at the price of $60 ended Monday.

San Francisco Call, May 23, 1912.

Meters for Nevada City

Nevada City (Nevada Co.), May 2.—All the meters of the Pacific Gas and Electric Company in this city will have been installed by the end of this week. Most of the crew, who have been here for the past several weeks, have completed their labors and left for other parts. Electric power will probably be charged on the meter rate commencing on June 1. The time between now and the first of the month will be spent by those to whom the meter is new in learning how to read it and practicing using as little electricity as possible.

John W. Werry, district manager of the Pacific Gas and Electric Company, stated this morning that word will be received from San Francisco in a few days, as to just when the flat rate expires and the new one begins, but that in his opinion it will be the first of June. Mr. Werry said that although some were dissatisfied with having the meters, many welcome them and desired to have their lights to be paid for on a meter basis at once.

Sacramento (Cal.) *Union*, May 3, 1912.

People of Oakley Rejoice

Contra Costa Town Connects up With "Pacific Service" for Electric Lighting

There was general rejoicing in Oakley on Wednesday evening, when the electric lights were turned on for the first time and the citizens generally felt as if a celebration should be held in honor of the event.

Announcement was made exclusively in the Ledger on March 23d, that the Pacific Gas and Electric Company had commenced the work of erecting a pole line for this service the day previously and it was but five weeks until everything was completed and patrons were being supplied with electricity for both light and power. This was a remarkably short space of time to complete such a piece of work, when it is considered that the line was run out of Antioch from the main supply station, a distance of eight miles. The town of Oakley was made a distributing point for supplying patrons and practically every house in the place has been wired. Not only this, but the line was extended to the Mitchell ranch, north of Knightsen, and that property was even supplied with current the previous week.

This has been no small task, as all the necessary equipment is new and arrangements were made by F. J. Southerland, manager of the Antioch District, for distributing the material and also providing the necessary number of employes for doing the work, there being between twenty and thirty engaged in the work at various times.

Although always having been found in the front ranks of progressive communities, Oakley and vicinity is now second to none, and this latest improvement will be of great benefit to that most prosperous section.

The new line is practically fifteen miles in length and about 400 poles were used in its construction. It is said the total cost, including the equipment, was approximately $20,000. When it is taken into consideration that portions of the district are sparsely settled, a company must have every confidence in its future development to make such an expenditure.

The linemen on Thursday began to construct a three-mile branch from the main line, beginning a short distance west of Oakley and running to a point on Dutch Slough on the levee of the California Fruit Canners' Association's property, to supply a pump on the B. F. Porter Estate.

A second branch line is to leave the main supply at the intersection of the County Road and the Santa Fe Railway southeast of Oakley, and run to the east side of the B. F. Porter Estate, which will give that property two service lines. Motors of 110 horsepower capacity are being installed on this tract as well as those of 50 horsepower by the California Fruit Canners' Association, to be used for pumping purposes.

A still further improvement is being made at Orwood, as a line is under construction from that point to the large dairy of Roy McCabe, which is to be lighted with electricity and the machinery operated by this modern method.

Antioch (Cal.) *Ledger*, May 4, 1912.

Merchants Getting in Line

Many Improvements in Lighting on Polk Street, San Francisco and Vicinity

In anticipation of the improved lighting system to take place shortly on Polk Street, many merchants are already doing their share in contributing toward this necessary and adequate necessity. Among the progressives along the thoroughfare installing new lights are the following: H. Rhoades, 749 Polk Street; Bullwinkel, 700 Polk Street; Pagaina Bros, 1042 Polk Street; T. Smith, 1135 Polk Street; Shapro's, 1303 Polk Street; Miss Nellie Padgett, 1305 Polk Street; Easton Bros., 1323 Polk Street; Ovadocich & Nickolas, Polk and California Streets; B. Dupony, 1854 Polk Street; F. S. Wratten, 2201 Polk Street; P. Carvis, 1850 Polk Street; St. Elmo Restaurant, 1312 Polk Street; and many others since this list was compiled.

The particular type of lamp now being installed by these enterprising merchants is an "outdoor gas arc," now being furnished by the Pacific Gas and Electric Company. Including the initial installation and maintenance, this company is making but the small charge of only fifty cents per month, which amount is certainly within the reach of almost every merchant in this district.

While the Polk Street District Association owns NO stock in this company, it is most certainly interested in this new movement on the part of the Gas Company, as nothing attracts like a well-lighted street, and when you consider the minimum expense and the maximum results everybody should likewise contract for one, if not more, of these excellent outdoor gas arcs.

Polk Street Journal (San Francisco), May 17, 1912.

Pump for Hop Company

The Pacific Gas and Electric Company is building a power line to Horstville which will furnish power for a big pump that is to be installed by the hop company for the purpose of irrigating their hops.

It is reported that the old dredger pit at the upper end of the Horst ranch will be utilized as a reservoir.

Wheatland (Cal.) *Four Corners*, May 3, 1912.

Car in Sutter County

Today the people of Yuba City and Sutter County were given the opportunity to see what can be done with electricity when the demonstration car built by the Northern Electric Company in the Chico shops for the Pacific Gas and Electric Company made its first appearance in Yuba City. The car was sidetracked at the local depot and was viewed by several thousand people. The interior of the car is a work of skilled hands and the many instances where electricity can be used to the best advantage was clearly demonstrated to the visitors. Employes of the Pacific Gas and Electric Company are on hand to explain or give any information that may be desired.

Marysville (Cal.) *Democrat*, May 1, 1912.

Quick Railroad Service

The Pacific Gas and Electric Company has inaugurated a five-minute service on the P Street line, with an extra car between 6 and 9:30 in the morning and 3:30 and 8 o'clock in the evening. The Tenth Street cars now only run from the swimming baths to Tenth and K Streets except when baseball games are on.

Oak Park (Cal.) *Ledger*, May 3, 1912.

Economy in Tungsten

In order to demonstrate the great saving that can be accomplished in the use of electric lighting by the use of tungsten lamps, Manager Poingdestre of the Pacific Gas and Electric Company offered to install 25-watt lamps on the electric arch located at the intersection of Third and D Streets for one month and thus prove its contention that the city will save at least 25 per cent in its cost of lighting services. The experiment was begun on the 25th of April and the meter records of all arches taken on May 25th. The following table will prove not only the great saving to be made by use of these lamps, but also proves that the gentleman was too modest in his estimate of the saving. The actual record is practically 50 per cent.

The following record shows difference between arches using the 16 candlepower carbon filament lamps and the 25-watt tungsten:

Third and C Streets	$15.52	621 kw.
Third and D Streets	7.82	313 kw.
Third and E Streets	14.10	564 kw.
Second and D Streets	16.75	670 kw.
First and D Streets	14.02	561 kw.
Fourth and D Streets	14.45	578 kw.
Fifth and D Streets	11.64	466 kw.

Marysville Evening Democrat, May 28, 1912.

Domestic Science Lessons

LESSON XI.—MEXICAN RECIPES

By MRS. H. ROSE STEWART.

BUEY AHUMANDO Y HUEVOS

To a cupful of chipped beef, soaked in hot water and chopped fine, add a cupful of strained tomatoes, two hard-boiled eggs cut fine, one tablespoon of grated cheese, one grated onion, a chile pepper chopped fine and a big lump of butter. Beat all these together, break in two raw eggs and scramble in a frying-pan.

CHILE CON CARNE

Cut a pound of fresh pork into inch chunks and parboil. Soak five chiles in hot water, take out the seeds and veins, wash them well and put in a mortar (the Mexicans use the Molcajete and Tejolote). Pound to a pulp, adding a little garlic, black pepper, two cloves and a cooked tomato. Fry this in hot lard; then add the meat with some of the liquid in which it was boiled and a little salt. Cover and let cook down until rather thick.

LENGUA DE BUEY CONCIDA

Dissolve one-half cupful of salt in enough boiling water to cover a beef's tongue and cook until just done. When cool remove the skin and slice thin. Take a dozen chiles anchos or large dry chiles, cut them the long way, remove all seeds, veins and the stem end; drop the skins into boiling water with one-half cupful of salt, press them under the water and keep at boiling heat two hours. Skim into a chopping tray, chop fine and press through a sieve. Add a teaspoonful of powdered summer savory, two of finely chopped onion, salt and a half-cupful of olive oil. Squeeze the juice of two lemons into a cup and fill it up with vinegar. Add this to the sauce by spoonfuls and a bottle of olives stoned and cut fine. Heat and pour over the tongue as it is served.

PUERCO EN ESTOFADO

Saute in a frying-pan a pound of young pork cut small; add the livers and gizzards of two chickens, an ounce of green root-ginger and three stalks of celery, all cut into small pieces. Then add, a little at a time, a mixture of four tablespoonfuls of olive oil, one of wine vinegar, one of worcestershire sauce, a dash of powdered cloves, salt and pepper. Add a half-cupful of boiling water and cook until nearly done; then put in a cupful of bean-sprouts and one of small mushrooms.

PULCHERO GRUESO

Cut up thee pounds of beef, one pig's foot, a half-pound of ham, the giblets of a fowl and a chile pepper and simmer together for two hours; add a slice of pumpkin, free from seeds, half of a small cabbage, a large carrot, a bunch of herbs, two large onions and some broken macaroni. Cook an hour longer, then put in six small sausages and boil until they are done. Strain, thicken the gravy and serve meat and vegetables on separate dishes.

POLLUELO EN ESTOFADO

Quarter a young chicken and fry in plenty of olive oil with half a cupful of finely chopped onion and diced raw potato mixed. Let this all fry until the fowl is white; add a little fine parsley and chopped green pepper and a little hot water. Season with salt and pepper and simmer over a slow fire until thoroughly cooked.

A LA MODA

Boil a well-cleaned fowl slowly until tender. When cold, cut from the bones in small pieces, and to these add a tablespoonful of chopped parsley, an onion and a pepper chopped fine; season with salt, chile powder and a little Spanish sausage. Line a mold with cooked macaroni, pour in the chicken, cover lightly and steam for an hour. Serve with tomato sauce.

CHILE CHICKEN

Boil a chicken until tender. When cold, cut into small pieces. Wash and dry a cupful of rice, put in hot olive oil, and fry for a few moments; add a peeled tomato, an onion cut fine, salt and chile peppers or powder. Put in the chicken and some of the broth, and cook until the rice is tender.

POLLO GUISADO

Steam two tender spring chickens for twenty minutes and then cut into pieces as for fricassee. Strain a can of tomatoes and mix with a can of corn and add a pepper chopped fine and a little parsley. Season with paprika, salt, cayenne, celery salt and black pepper. Put the pieces of chicken in this and thicken with cracker crumbs. Turn into an earthen baking-dish, put big lumps of butter over the top and bake for half an hour.

HECHO EN CASA

Take three cupfuls of sifted flour, a tablespoonful of lard, a level teaspoonful of salt and enough water to make it like a pastry dough. Roll very thin and cut the size of a dessert plate. Have ready in a large frying-pan some hot lard, enough to float the tortillas, but not so hot as to brown them. Put in the tortillas, one at a time, and when they begin to blister they are done. This quantity will make about two dozen.

TORTILLAS DE PATATAS

Work a large cold boiled potato with a big teaspoonful of lard and a teaspoonful of salt into a pint of flour and add water until about the consistency of bread dough. Knead thoroughly and divide into chunks about the size of an egg and roll very thin. Brown very quickly on a smooth hot stove, turning often. When thoroughly cooked, place between a cloth and keep covered in this way until ready to use.

TAMALES

Tamales are a mixture of meat or fowl made hot with chiles and wrapped in corn husks. In preparing the dough or nixtamal, unless scalded meal is used for a substitute, it is necessary to prepare the shelled corn with lime-water. The Mexicans grind the corn prepared in this way, on the metate, and instead of a mortar use the molcajete and lejolote.

To prepare the corn, cover it with water, add the lime water and boil until the husks slip off easily between the fingers, then wash in cold water until perfectly white. The lime water is made by adding an ounce of common lime to a quart of water; stir well and let settle, when clear, drain off the water for use. One quart of lime water prepared in this way will do for a pound of corn. For the wrapping, cut off the inside leaves of the corn husks about an inch from the stalk end and boil in clear water until perfectly clean. Tear a few in narrow strips to use for tying the ends; dry the rest and rub them over with a cloth dipped in hot lard.

HOT TAMAL

For the dough, add to one pint of corn meal, one tablespoonful, each, of salt and lard, and enough boiling water to make a thick dough. Prepare the corn husks as directed. For the filling boil one pound of beef and pour over it hot beef fat; cut into small bits and season with salt and chile sauce. Put a layer of the dough in the husk, over this a tablespoonful of the prepared meat; roll like a cigarette, with a layer of dough between each husk. Tie each end and steam two hours.

ENCHILADAS

Enchiladas are made of tortillas sprinkled with cheese, onion, olives, etc. They are adorned with lettuce leaves and radishes, but are always covered with hot chile sauce.

Tortillas are the national staple article of food, and are made of Indian corn ground on the metate, mixed with a little water and cooked on a flat surface over hot coals.

ENCHILADAS
(AMERICANO)

Cut six large red chile peppers in halves, remove the seeds and veins and cook in boiling water fifteen minutes, then press through a colander. The sauce should be thick and smooth. Chop the dark meat of a cold cooked chicken, season with salt and add two tablespoonfuls of the pepper pulp. Beat two eggs without separating, very light, and add a cupful of milk. Mix a half-cupful of corn meal with a cupful of flour and a little salt; pour the egg and milk in this, making a thin batter. Put a little olive oil in a frying-pan, and when boiling hot turn in enough batter to make a thin cake about six inches in diameter. Shake the pan until the mixture is set, then put two tablespoonfuls of the chicken mixture on one side of the cake, roll with a knife and remove to the serving dish. When all are made, pour over the remaining chile sauce and sprinkle the whole with grated Parmesan cheese.

SAUCE FOR ENCHILADAS
CHILE

Cut open two chiles and take out all the seeds and thick yellow veins; put them on the back of the stove in cold water enough to cover them and let soak for two hours. Pour off this water and cover again with fresh water and boil fifteen minutes. Drain in a colander and save the water in which they were last boiled. When cold enough to handle, take a knife, scrape off all the pulp from the skin, and put in the water in which they were boiled and mix thoroughly. Fry two onions chopped fine in olive oil to a delicate brown; add a teaspoonful of flour and allow that to brown also. Stir in the chile mixture, season with salt, and let all thicken together.

BEANS MEXICAN

Soak two cupfuls of pink beans in six of water overnight; in the morning add a small onion and boil gently until soft; take out the onion and set the beans to drain. Put a large tablespoonful of fresh lard in a skillet and when sizzling hot add the drained beans. Mix beans and lard thoroughly until each bean seems to have a coating of fat and begins to burst. Add a cupful of the liquid in which the beans were boiled and gently crush a few of the beans with the spoon to thicken the gravy. Add the remainder of the bean liquor and a chopped chile pepper and simmer until the beans are quite dry.

RELLENOS DE QUESO DE GRUYERE

Put six chile peppers in the oven for a few moments and then wipe off the outer skin. Cut off the tops and carefully remove seed and veins. Make a stuffing of strips of Swiss cheese, flavored with chopped onion, parsley and a few drops of lemon juice. Fill the peppers, not very full, with this. Beat four eggs, whites and yolks separately, put together and thicken with a teaspoonful of flour. Dip the chiles in this batter and fry in hot olive oil until brown. Serve with tomato sauce.

PIMIENTOS

Chop some cold cooked beef very fine and add one-half the amount in each, of finely chopped raisins and chopped walnut meats. Prepare the peppers for ordinary stuffing, only scrape rather thinner. Fill with the mixture, dip in thin egg batter and fry brown. Serve with chile sauce.

PLATO FUERTE

Select even-sized chile peppers and cut out the stems, seeds and cores. Make a stuffing of boned and skinned sardines mixed with finely chopped cheese, blended together with beaten egg. Stuff the peppers with this, dip in thick batter and fry in deep fat. When thoroughly cooked, drain on brown paper and serve very hot.

FRIJOLES CON QUESO

Boil two cupfuls of red beans until soft; drain and put in a skillet with a tablespoonful of hot lard and fry, pressing a few to thicken the gravy. Add a cupful of hot water and when bubbling put in a cupful of grated cheese. Season with salt and chile sauce.

FUENTE ITALIANO

Boil spaghetti until tender, strain and put into a deep baking dish. Chop an onion and a clove of garlic fine and add, with three peeled, sliced tomatoes. Dilute chile powder to taste in a little water and pour over all. Cover the top with grated cheese and put in the oven to brown.

GREEN CHILES

Boil two pounds of meat until tender and chop fine; add a large ripe peeled tomato, two sliced onions, two slices of bread chopped fine, raisins, olives, salt and a tablespoonful of vinegar. Fry all these together in olive oil and season with a little sugar and pepper. Remove the stems and seeds from six green chile peppers and stuff them with this dressing. Dip each chile in batter and fry in deep lard.

DESSERTS

REALENGO

Rub three-quarters of a cupful of fresh fruit through a seive; heat and sweeten. Beat the whites of three eggs until stiff; add gradually the hot fruit pulp, beating continually; turn into a buttered mold, set in a pan of hot water and bake in a slow oven until firm. Remove and cover the top with whipped cream, flavored with sugar and wine and decorated with preserved cherries, angelica or citron.

TORTO FRUTAS

Line the sides of a baking dish with a light puff-paste; cover the bottom with sliced pineapple; next, a layer of peeled sliced oranges, then sliced bananas and then a few thin slices of lemon. Sift a most generous supply of sugar between each layer. Repeat the layers until the dish is full and cover the top layer with chopped nuts. Lay over the top narrow strips of the pastry and bake slowly for an hour or more.

MANTECADO

Melt a cupful of granulated sugar in a smooth saucepan; add a cupful of English walnut meats and pour into a shallow buttered pan to harden. When cold grate of chop fine. Crumble twelve macaroons fine and toast in the oven a few moments. Make a custard of the yolks of two eggs, a fourth of a cupful of sugar and a cupful of milk, then pour over the stiffly beaten whites of two eggs and let cool. To a pint of cream add a third of a cupful of sugar and beat until thoroughly mixed, add the custard and flavor with maraschino, then freeze. When half frozen add the macaroon crumbs and half of the grated walnut mixture and finish freezing. Sprinkle the remaining grated walnuts over creeam at serving time.

HOW TO MEASURE AN OUNCE

Housekeepers are often confused by the mingling of weights and measures in a recipe, therefore an accurate schedule is a good thing to have around. The following of the most generally used articles will be found correct:

An ounce of granulated sugar, equals two level tablespoons.
An ounce of flour, four level tablespoons.
An ounce of butter, two level teaspons.
An ounce of ground coffee, five level tablespoons.
An ounce of cornstarch, three level tablespoons.
An ounce of thyme, eight level tablespoons.
An ounce of grated chocolate, three level tablespoons.
An ounce of pepper, four level tablespoons.
An ounce of salt, two level tablespoons.
An ounce of mustard, four level tablespoons.
An ounce of cloves, four level tablespoons.
An ounce of cinnamon, four and a half level tablespoons.
An ounce of mace, four level tablespoons.
An ounce of curry, four level tablespoons.
An ounce of chopped suet, a fourth of a cupful.
An ounce of olive oil, two tablespoons.

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Antioch	Antioch	F. J. Southerland
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Chico	Chico	H. B. Heryford
Colusa	Colusa	L. H. Hartsock
Contra Costa	Martinez	Don C. Ray
Fresno	Fresno	W. M. Henderson
Grass Valley	Grass Valley	John Werry
Marysville	Marysville	J. E. Poingdestre
Marin	San Rafael	W. H. Foster
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PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	187	1,081,222
Gas	49	978,167
Water	10	45,825
Railway	1	60,000

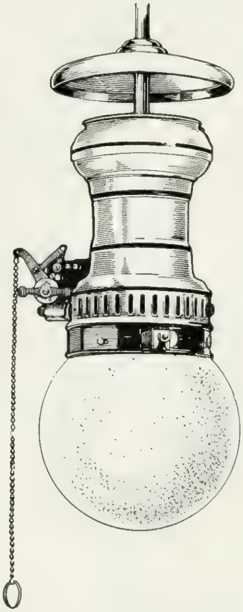
Place	Population
Alta	20
[1] Alameda	25,000
[2] Albany	800
Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Broderick	200
Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corde Madero	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
Dobbins	50
Davenport	1,000
Drytown	20
Durham	500
Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
Ione	900
Irvington	1,000
Jackson Gate	100
Jackson	2,035
Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Martinez	5,000
Martell	150
[2] Marysville	7,000
Mayfield	1,500
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Vacaville	1,200
[2] Vallejo	15,000
Walnut Crek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Yolo	400
[2] Yuba City	1,200
Total	1,136,222

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,500 people.

OPERATES 11 hydro-electric plants in the mountains.
4 steam-driven electric plants in big cities.
17 gas works.

SERVES ⅔ of California's population.
30 of California's 56 counties.
An area of 37,950 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.



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PACIFIC GAS AND ELECTRIC MAGAZINE

PACIFIC GAS AND ELECTRIC COMPANY
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Published Monthly by
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SAN FRANCISCO

VOL. 4 JULY, 1912 NO. 2

RIVER VIEW IN THE ANTIOCH DISTRICT

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Pacific Gas and Electric Magazine

Vol. IV

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PACIFIC GAS AND ELECTRIC MAGAZINE

VOL. IV JULY, 1912 No. 2

Impressions of the National Electric Light Association Convention at Seattle

By FREDERICK S. MYRTLE, Manager Publicity Department.

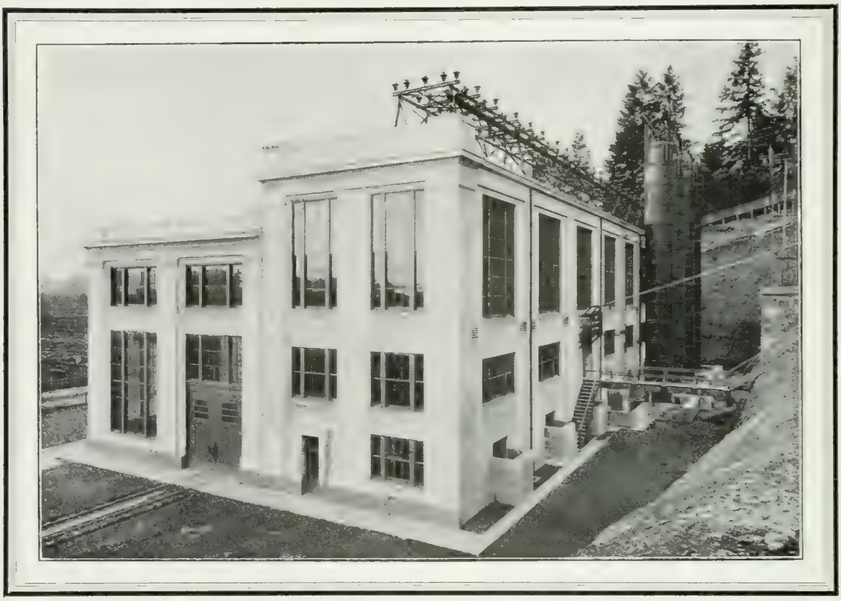
F. S. Myrtle

The thirty-fifth annual convention of the National Electric Light Association came to the Pacific Coast this year, being held at Seattle from June 10th to June 13th. It was a decided experiment to hold this gathering on the western side of the Rockies, for it involved a very long journey for a great majority of the delegates who attended. But while in point of numbers the attendance was not quite up to former years, it cannot be said that the experiment was anything but successful. Fully fifteen hundred members of the Association from all parts of the country enjoyed a week's sojourn on the banks of Puget Sound, and in character, earnestness and beneficial results the convention fairly ranks with any of its predecessors.

One thing that contributed to its admitted success was the string of special trains that brought bunches of delegates to the place of meeting. The specials from the East numbered five, including the Red Special *de luxe* from New York, carrying about one hundred and twenty delegates and their wives, and which took the southern route via the Grand Canyon of the Colorado and California; the Pink Special, carrying a party of eighty-one from Boston, New York, Philadelphia and other eastern points over the Canadian Pacific route; the Green Special from Chicago, which carried its living freight of ninety persons through Canada by way of Banff and Vancouver; the Orange Special, also from Chicago, with a party of sixty; and the Purple Special from St. Louis, which took its party of forty-five delegates by way of Glacier National Park. Then there was the Golden Poppy Special, needless to say, from California, which carried one hundred and five passengers from north and south of Tehachapi over the picturesque Shasta route.

The days of travel aboard these various trains gave the delegates excellent opportunity to become acquainted and to exchange notes, so that before they reached the Convention City they were practically organized and trained for work.

Other delegates made their way to Seattle by ordinary trains and there was, of course, a handsome representation of the light and power enterprises in the immediate vicinity. There were many big men on hand. The Commonwealth Edison Company of Chicago was represented by Mr. Samuel Insull, its President; Mr. John F. Gilchrist, Mr. Insull's assistant and President of the National Electric Light Association, and a delegation of sixteen men. Mr. H. L. Doherty headed



White River Power Plant, near Tacoma

a delegation of thirty-five officers, managers and superintendents of his operating companies. Mr. H. M. Byllesby was on hand with a delegation of twenty-four. The Stone and Webster representation included one hundred and sixteen from the Puget Sound organization and twenty-two from other parts of the country, headed by Mr. F. S. Pratt, Vice-President of the S. & W. Management Association. Other prominent men included Jos. B. McCall, President of the Philadelphia Electric Company; Chas. H. Hodskinson of the Edison Electrical Illuminating Company of Boston; Frank M. Tait of the Dayton, Ohio, Power and Light Company; R. H. Ballard, of the Southern California Edison Company; President J. B. Murray of the New York Edison Company, and others.

In this galaxy of talent "Pacific Service" made no inconsiderable showing. The Pacific Gas and Electric Company was represented by a corps of twenty-two men, headed by Mr. John A. Britton. Besides the Vice-President and General Manager, the list included Messrs. A. F. Hockenbeamer, Second Vice-President and Treasurer; Stanley V. Walton, Manager Commercial Department; Lee H. Newbert, Manager Appliance Department; Geo. C. Robb, Superintendent of Supplies; John H. Hunt, Purchasing Agent; F. S. Myrtle, Publicity Manager; J. D. Butler, Auditor San Francisco District; H. P. Pitts, Industrial Engineer; J. P. Jollyman, Civil Engineer; Paul M. Downing, Chief Engineer Hydro-Electric Section; Fred R. George, Load Dispatcher, and H. N. Mosher, T. E. Fogelsang, J. W. Varney, Geo. H. Bragg, A. R. Thompson, C. J. Wilson, A. U. Brandt, F. S. Gray and F. J. Gotlob of the Electrical Engineering Section.

A hearty welcome was accorded the incoming delegates upon their arrival. Each train was met by a corps of alert young men wearing ribbons and, through the courtesy of the local companies and their friends, visitors were quickly transported to their hotels in automobiles. At each hotel a representative of the Entertainment Committee assisted the delegates to find their way about, and there were electric signs of welcome everywhere.

The State Guard Armory, a handsome, stately pile overlooking the wonderful inland harbor, was the convention hall. There every arrangement was made for the guidance and comfort of the delegates and guests. Registration was made, badges were given out, and papers distributed, so that before the first general session took place every member of the convention had opportunity to digest the program before him and to choose from the pile of literature in his possession the matters that most interested him and in the discussion of which he thought it to his interest to take part. Mr. T. C. Martin of New York, the able and energetic Secretary of the Association, worked like a beaver to make everybody feel comfortable and generally to promote the success of the undertaking.

Monday, June 10th, saw the general assembling of the delegates. They came formally together at a reception and dance that evening, when Mr. John F. Gilchrist, the President of the Association, and Mrs. Gilchrist received the streams of correctly attired men and fashionably gowned women. The program of work laid out for the convention comprised nineteen separate sessions extending over three days. In several instances they were run in parallel so as to permit the work to be done within the time available. The program followed the lines of previous gatherings in that it included general, executive, technical, accounting, commercial, power transmission, and public policy sessions. All were well attended, and the general interest in the work of the convention was noticeable in the animated discussions

Interior of Power House, White River Development that followed the presentation of the various reports. A Convention Daily, under the management of the Electrical World, faithfully reported proceedings, kept record of the delegates and their doings and contained a deal of interesting matter.

President Gilchrist's annual address on the opening day called attention to a very encouraging condition of affairs. There had been a fair growth in membership during the year past and also in company sections. Important recommendations made by the report included a reserve fund of five hundred thousand dollars, the erection of permanent headquarters somewhere in the East, co-operation between the corporations, firms and individuals engaged in electrical development, closer relations with various institutions of learning, co-operation with the Public Service Commissions in the interest of harmony and fair business, a general study of the municipal ownership problem, uniformity in rate schedules, the preservation of the good name of electric securities and, most important of all, the promotion of mutual good feeling and understanding between the public utility companies and the public they serve.

That evening a most interesting Power Transmission session was held at which Mr. H. L. Doherty presided. Features of the session included an address by Mr. Doherty on the Government's policy regarding conservation, of which more anon, and a paper by Mr. C. H. Williams, of Denver, on "The Use of Electricity for Irrigation and on the Farm." The report was mainly devoted to an account of the developments in the Colorado region, but it did contain this reference to our work out West:

"In California over ten thousand irrigation wells have been put down and one hundred and thirty-five thousand horsepower made use of for lifting the water which irrigates three hundred thousand acres."

During the discussion which followed this paper, Mr. Britton was called to the rostrum to tell of the part "Pacific Service" is playing in the irrigation and reclamation work going on in North Central California. It was pioneer work, he explained, and his recital of the developments existing and in contemplation was received with much interest.

"Pacific Service" got another boost in the report of the Committee on Electrical Apparatus. Among the "recent good examples of the several types and designs of station buildings and ornamentation of grounds surrounding stations" appeared a picture and notice of San Francisco Substation "D", on Bush and Larkin Streets, of which Manager Geo. C. Holberton is so justly proud.

Space will not permit a full discussion of the various sessions, all of which were interesting and instructive. It must suffice here to touch the high places.

There was a hearing on rates the second day at which an animated discussion took place on the question of uniformity. It appeared to us Westerners, however, that the rate question in the great majority of cases suggests Hancock's celebrated remark about the tariff, viz.: that it is a local issue, governed by local conditions and to be dealt with accordingly.

On Wednesday afternoon a paper was presented by Mr. J. C. Hoyt, of the United States Geological Survey at Washington, on "Work and Publications of the United States Government relating to Hydro-Electric Development." Following this, Mr. Britton told how the company he represented had made a point of co-operating with the United States Government in furnishing data on rainfall, run-off, extreme fall, etc., and requested information as to what the Government had done to co-operate with other hydro-electric companies or they with it. Then followed the report of the Power Transmission Committee, read by Mr. David B. Rushmore, of the General Electric Company, which set forth that in the opinion of the Committee the development of water-power was true conservation of the natural resources of the country, but under the guise of conservation of natural resources a remarkable school of political economy and statesmanship had sprung up, and the United States Government had proved the great obstacle in the way of water-power development. This started the most important open discussion of the session. Mr. Doherty was called upon to re-read his remarks on conservation delivered at the previous Power Transmission session. The tenor of his observations may be gathered from the following excerpts:

"Forests do not conserve the flow of the streams as well as tilled soil."

"Builders of enterprises are regarded as public enemies."

"The public has an idea that there is something wrong somewhere, and, consequently, stands ready to follow any unscrupulous demagogue or political dreamer—provided he is sufficiently intemperate of speech—who promises to remedy the evil."

The *piece de resistance* was then brought on in the person of Judge Richard Ballinger, formerly Secretary of the Interior under President Taft, and now a resident of Seattle. In masterly style Judge Ballinger sketched the history of the public domain as legislated over by Congress, beginning with the Homestead Act in the early sixties when Lincoln was President, and showed how it was originally intended to parcel out the public domain for intending settlers and explorers for development of individual enterprise. It was intended, he said, to give a free easement to the developer. Therefore, the doctrine of conservation as laid out by the extremists was ridiculous and impracticable.

"The Government is undertaking to control the water power development of the public domain," said the veteran statesman. "How unfair that is we of the West well know. Every State coming into the Union should have the same rights and privileges as the older States. The East and Middle West had the benefit of the exploitation of the public lands. Now the Government is setting itself up in the power-site business. It was never contemplated that the Government should act the part of landlord in any particular. It should go out of that business and relegate it to the people of the States in which the lands are situated.

"Real conservation means making the best use of these natural resources honestly and fairly, but it is has interfered with the bureaucracy at headquarters, so now they are drawing the strings tighter every day around the public domain to the prejudice of the Western people who ought to be enjoying it. They have even proposed to amend the Mineral Lands Law so as to grant only leases or permits. It is the arbitrary dictum of the executive officer."

Mr. Britton was called upon to express the views of the West on this question. He spoke of the cloud of misrepresentation that had compelled the power companies on the Pacific Slope to force their way forward as best they could. The work of building up Eastern States had been accomplished, but now the Government proposed to check progress and development to the prejudice of the West.

"There is something like six millions available horsepower in the Sierra snows today and but three hundred and fifty thousand delivered at the central stations" said Mr. Britton. "Must we stop here at the bidding of the Government and halt in our progress? This is an empire that must be built. It has been truly said 'Westward the star of empire takes its way.' The Western States may have been recreant of their duty in presenting their case to Congress. These people of the East do not mean to oppress their Western brethren, but they do not understand the situation or us and they have been kept from understanding by wilfull misrepresentation."

Another most interesting session was that on Wednesday night when the report of the

Public Policy Committee was presented and read by Mr. Samuel Insull. The report dealt with various features of the organization and conduct of the light and power business, and on the question of ownership of public utilities opposed any department of the Government, federal, state, or municipal, engaging in private enterprise. Mr. Insull followed up his reading of the report by an address to the Convention in which he endorsed the opinion of the Committee on Progress that "a public utility should be a regulated and protected monopoly." Mr. Insull said:

"The public interests are best served by giving public service companies a monopoly in the territories they cover. Competition destroys existing values and makes enterprise of uncertain stability. The field of fairly productive private enterprise must not be invaded.

"The municipal ownership agitation must be met by economic conditions. The generation and distribution of electrical energy can be most economically done by the concentration of production and distribution. The only way to get results out of the investment is through concentration, in other words, monopoly. In New York today, concentration would save about one hundred and fifty million dollars, in Chicago one-half that amount. What is economically right must be practised eventually.

"We are living in an age when it is fashionable to abuse the corporations. I do not know the cause. Whether our methods are wrong, I do not know. All I know is we try to make them right, and the returns on a public service business are absurdly small compared with what one should reasonably expect from a private business. There is a symptom and feeling that something is wrong. People have axes to grind, selfish interests to serve, and some seek to lift themselves in the political scale by pulling down others. It is up to us to set them right. It is encouraging to hear of Public Utility Commissions. The result of their establishment throughout the country will go far to stop the incidental troubles from competition in a business which should be run as a monopoly. We should encourage these commissions provided they allow us a return upon our investment which after all is little more than can be derived from putting our money out on farm mortgages in the western country."

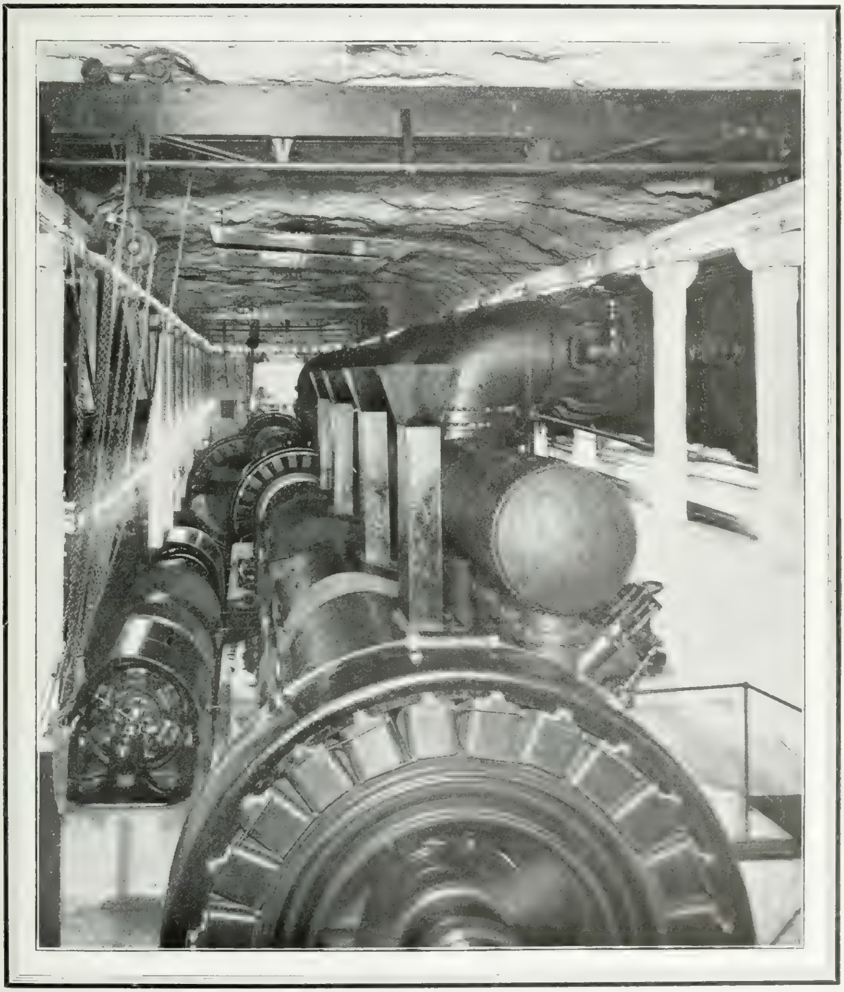
In conclusion, Mr. Insull spoke of the capital necessary to run great enterprises of the kind he was discussing. Capital, he said, was necessary to gather new business and protect the integrity of securities. His remarks were listened to with manifest attention and evoked considerable applause.

The convention came to an end on Thursday with the election of the new board of officers. Mr. Frank M. Tait, of Dayton, Ohio, was chosen President; Mr. Jos. B. McCall, of Philadelphia, First Vice-President; Mr. H. H. Scott, of New York, Second Vice-President, Mr. W. W. Freeman, of Brooklyn, Treasurer; and the following members of the Executive Committee for three years: Messrs. John A. Britton of San Francisco, C. E. Groesbeck of San Diego, and C. A. Stone of Boston, Mass. Mr. R. S. Orr of Pittsburg was elected a member of the Executive Committee for one year to succeed Mr. H. H. Scott.

During the Convention days a special program of entertainment was gotten up for the ladies. This included trips on the Sound and around and about Seattle. On Friday, June 14th, a large party of delegates and their ladies were guests of the Puget Sound Traction, Light and Power Company on the trip to Snoqualmie Falls and the White River Power plants. It rained, but all had a good time, and the scene at the Falls was most attractive. It was a thousand pities that, owing to numbers, admission to the Cavern power house in the rock at Snoqualmie was denied. The only means of getting into this station is through a shaft 270 feet deep by a small elevator used by employes for getting back and forth, and any attempt to handle a large number of persons in this way would be attended with great danger. The White River plant is a good specimen of up-to-date construction.

On our way home a number of us stopped over at Portland where we visited the Cazadero and River Mill plants of the Portland Railway, Light and Power Company. But few of us had seen an Amberson type of dam and it was a most interesting spectacle. This dam was fully described in the May issue of the magazine.

Just a word about the exhibit room in the Convention hall. This was really a wonderful spectacle and attracted visitors far



Interior of Cavern Power House, Snoqualmie Falls and wide. The General Electric Company, The Westinghouse Company, The Johns-Manville Company, Fort Wayne Electric Works, The Pacific Electric Heating Company, Electric Storage Battery Company, in fact, all the big appliance houses of the East and West were represented with every sort of electrical device imaginable.

While in the Pacific Northwest the writer had the pleasure of meeting several of the big power developers who attended the convention. From all that was said in and out of the convention hall it would seem that in some respects the men on the other side of the Rockies are ahead of their Western brethren. They are masters of detail, surely. There is one Eastern Company that devotes a whole floor of its building to a Bureau of Statistics. They go in largely for organization and may be said to know their business from the ground up. But, with all that, it is a question whether they achieve any greater results than we of the Wild and Woolly West, and there is one thing which the writer regards as beyond question, namely, that in activity and enterprise we are the equals, if not the superiors, of our Eastern friends. It is just as Mr. Samuel Insull said in the course of his address to the convention on Public Policy night:

"You men of the West who have had to find a market for your commodity have had your wits sharpened by the difficulties you have had to overcome."

Mr. Insull suggested a combination of the energy and experience of the two opposite ends of the continent, to the advantage of both. In the humble opinion of the writer, that appears a sane, sensible and practical suggestion. It should be "Hands across the Rockies" from now on. That's the true progressive policy.

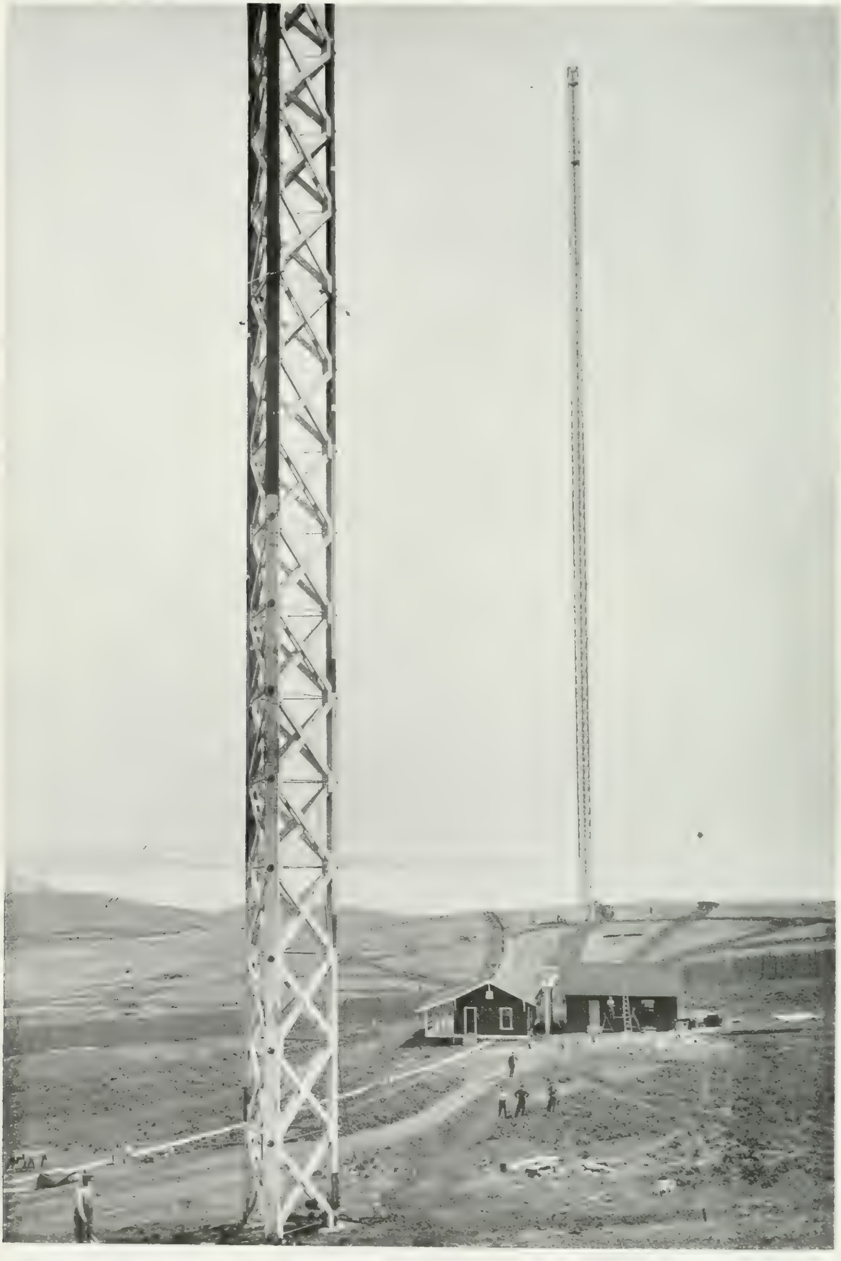
"Pacific Service" at a Banquet

ON the opposite page will be found portrayed the scene of a banquet given at the Fairmont Hotel on the evening of Friday, June 7th, by "Pacific Service" to Mr. Samuel Insull of Chicago, who was recently elected a member of the Board of Directors.

Mention of this was made in the June number of the magazine. Vice-President and General Manager John A. Britton presided and had the guest of honor at his right hand, while at his left sat President Frank G. Drum. The Board of Directors was well represented, for in addition to those mentioned Messrs. John Martin, Henry E. Bothin, C. O. G. Miller, John S. Drum and A. F. Hockenbeamer did honor to their famous Eastern colleague. There was an excellent turnout of Heads of Departments, District Managers and Division Superintendents. The assemblage numbered fully one hundred.

It was a delightful affair. The chairman of the evening, of course, made the address of welcome, and in replying Mr. Insull gave some valuable advice to the members of "Pacific Service" on the subject of departmental co-operation and individual responsibility. Mr. E. C. Jones gave a five-minute talk upon the latest improvements in gas manufacture. Property Agent Roy Cantrell was on hand with his lantern, and the banqueters were treated to a number of stereopticon views of the Company's system. In a word, it was just one of those "get together" reunions that promote general enthuiasm in an organization such as ours.

Banquet given by "Pacific Service" to Mr. Samuel Insull, at the Fairmont Hotel, in San Francisco, on the evening of Friday, June 7th, 1912. Reading from left to right, the following are seated at the Speaker's table—Messrs. E. C. Jones, Henry E. Bothin, A. F. Hockenbeamer, John Martin, Samuel Insull, John A. Britton, Frank G. Drum, C. O. G. Miller, John S. Drum, Chas. L. Barrett, W. B. Bosley, Jas. H. Wise.



View of 440-foot towers at the Federal Telegraph Company's new 30-kilowatt wireless station at San Bruno Point, San Mateo County, Cal.

Telegraphy by Waves Without Wires

Written expressly for the Pacific Gas and Electric Magazine by HOWARD P. VEEDER,
Secretary and Treasurer of the Federal Telegraph Company.

THE Federal Telegraph Company of California is carrying on its wireless telegraph service along the Pacific Coast and as far east as Chicago, by means of the Poulsen System of Wireless Telegraphy.

This is a system invented by Valdemar Poulsen, a distinguished Danish scientist, and is a radical departure from all previous systems in use. It is the result of many years of experiment and research on the part of Poulsen, who, along with Marconi, Tesla, and other pioneers in this particular art, took up the problem of improving and perfecting wireless communication, after Hertz, the great German scientist, first discovered the possibility of generating electro-magnetic impulses which would travel great distances through the ether, and which, in honor of their discoverer, are now known as "Hertzian Waves." From the work of Marconi and others, all of the "spark" systems of wireless telegraphy have been developed. They all, however, are fundamentally alike, although there are differences and refinements in the sending or receiving apparatus used.

"Damped" waves are those whose amplitude and, consequently, whose energy does not remain constant throughout the distance

Interior of Federal Telegraph Company's station at Chicago, showing Poulsen generators over which they travel. "Undamped" waves, on the contrary, are symmetrical in all respects and remain unchanged in formation and character. They are like the waves one sees on the ocean which are practically of equal height and equal distance between wave crests.

All spark systems utilize "damped" waves and it remained for Poulsen to discover and perfect a method of generating "undamped" waves.

All "spark" systems depend on communicating their signals by a series of intermittent impulses. If the key is pressed down for a more or less appreciable interval of time, the signal is a dash. If the key is almost instantly realeased, the signal is a dot. During the interval between the dots and dashes, no energy is communicated through the ether. The waves generated in this manner are of great amplitude and strength initially, depending upon the capacity of the station, but almost instantly are greatly reduced in both these respects.

In the Poulsen System these "undamped" waves are set in motion as soon as the Poulsen generator is started. The signals are not communicated by the intermittent impulses above described, but by changing slightly the original wave length by altering the capacity, etc., of the sending apparatus.

On account of the intermittent method employed in sending out these electro-magnetic waves by the "spark" systems, the question as to whether or not these waves reach a certain point depends upon the energy of each initial impulse. It is like throwing a rock into a pond: if the rock is big enough and the pond is not too large, the waves, which are very large right at the point where the rock falls into the water, will finally reach the shore, although very diminished in size. In the Poulsen System, however, the waves not only preserve their original form, but as the energy is being sent out constantly, one wave reinforces the other.

There have been three great drawbacks to wireless telegraphy as it has been developed by all of the "spark" systems. First, its use has been limited almost entirely to marine work. All of the great wireless companies of the world, such as the Telefunken, the principal German company, the Marconi Company, the great English and Atlantic wireless corporation, and the United Wireless Company of the United States, have been obliged to limit their activity to the handling of business from ship to shore, and vice versa. All of the great seaport cities of the modern world are equipped with wireless stations, but a map of the interior of the United States, or of any other country, preceding the construction of the Poulsen Stations by the Federal Telegraph Company, has shown nothing but a blank in this respect.

These Hertzian Waves are supposed to follow the surface of the earth or water. On the water there are no obstructions, hence the progress of the waves is not easily checked. In land, everything in the way of trees, buildings or mountains, form serious obstacles. A fair sized "spark" station may work to a considerable distance at sea, but its signals, as a rule, will not penetrate more than a few miles inland.

The second great drawback has been the fact that the efficiency of all the "spark" systems has been three or four times as great, as far as distance is concerned, at night as in the daytime. Stations that can reach a ship at night through a distance of 1,000 or 1,200 miles cannot send more than 200 or 300 miles during the daytime. This is supposed to be caused by the ionization or electrification of the ether by the sun's rays, which presumably makes it much more difficult for the artificially created waves to travel through the ether, and also causes a greater absorption of energy by the earth.

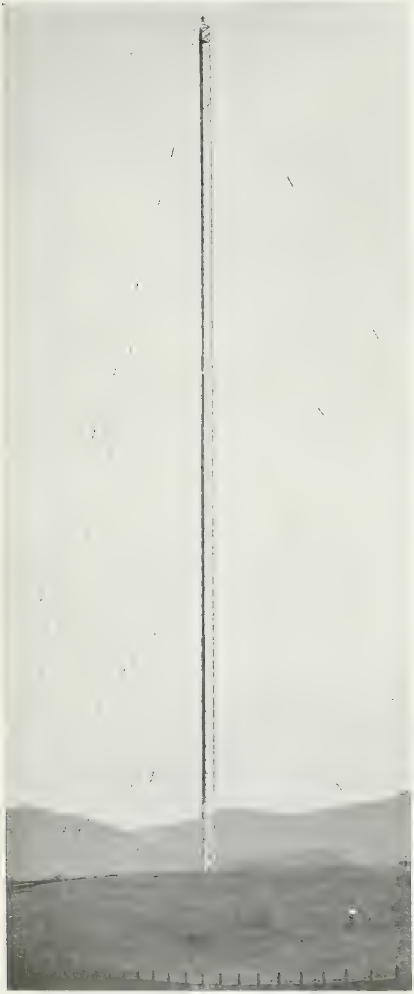
The third essential drawback of "spark" wireless is the impossibility of keeping amateur or other wireless stations from reading

Central Point Station, near Medford, Oregon

messages not intended for them. This is because of the fact that delicate "tuning" is impossible in all of these systems. Without attempting to explain the why and wherefore of the matter, the following comparison may serve to illustrate the points of difference in this respect between the "spark" and Poulsen systems. If a pistol is fired near a piano, all of the strings will be forced into vibration. When a powerful "spark" station is sending, all of the other stations, both large and small, within a certain radius, are able to receive the signals on account of the forced oscillations thus set up. If, on the other hand, a C tuning fork is struck and placed on the strings of a piano, only the C strings will respond. This ability to select only certain wave lengths and discard all others, is one of the principal distinguishing features of the Poulsen System. In addition to this, Poulsen signals can only be read by using Poulsen receiving apparatus, which is very closely patented.

The Poulsen System possesses many other features which are interesting, both from a technical and practical standpoint. The character of the waves generated especially adapts them for use in wireless telephony. Conversations by wireless telephony between the company's stations at San Francisco and Stockton, which are themselves 100 miles apart, have been heard at Los Angeles, a distance of almost 500 miles. This feature of the system has not yet been developed as much as the telegraph, but holds great promise for the future.

The frequency of the current generated by the Poulsen generator is from 150,000 to 1,000,000 oscillations per second. On account of this high frequency, the current can be passed through the human body without any appreciable effect. Poulsen has recently been in consultation with some of the leading physicians in Vienna, who believe that this current can be of great value therapeutically in applying heat or antiseptics internally, both of which have been objects long desired by the medical profession. An incandescent lamp can be lighted from the current passing through one's body without the person feeling the current in any way. One can also hold a carbon in his hand and create an arc of intense heat and brilliancy by bringing the carbon in close proximity to another carbon held by another person, neither one being conscious of the current transmitted through them.



View of tower at San Bruno Point, showing man at the top

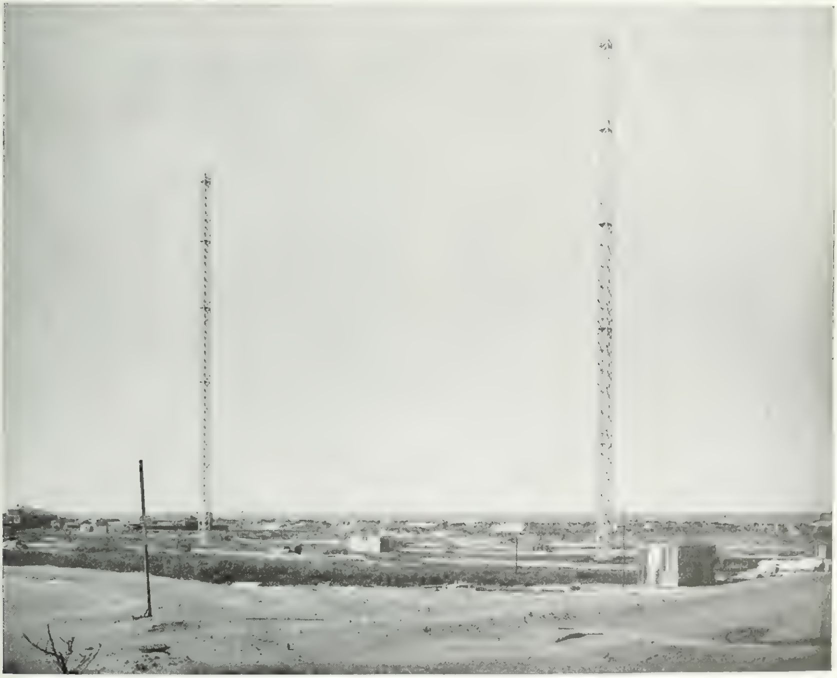
It is possible for this system to use a rapid mechanical method of transmitting its signals. A message received at one of its offices can be punched on a tape, which is arranged so as to differentiate between dots and dashes. This tape is sent through a mechanical sender at a rate of 150 to 300 words per minute. At the receiving station these impulses are received by a vibrating gold wire of extreme fineness. The shadow of this moving wire is thrown on a moving photographic tape which runs through a developing and fixing bath and furnishes a record that can be translated by a receiving operator as it comes out of the machine.

This system has also accomplished Duplex sending and receiving, which means that two messages can be sent, or two messages can be received by the same antenna simultaneously. This has never before been accomplished by any system of wireless. Duplex sending is now being done regularly at several of the Poulsen Stations.

Contrary to the history of most developments of this kind in the United States that have great promise, the Poulsen System has been first tried here in the West, and particularly in California, and its use is being extended toward the East.

About two and a half years ago, Mr. C. F. Elwell, one of Stanford University's most brilliant graduates, who had specialized in wireless telegraphy, appreciated the fact that the Poulsen System was the only wireless system known that had permanent merit in the way of accomplishing land transmission commercially. He enlisted the aid of some of the Stanford professors who understood its scientific possibilities, and went over to Europe for the purpose of obtaining the United States rights from Poulsen. After he had spent several months in experimental work with Poulsen, the latter agreed to give Mr. Elwell the right to develop his system in the United States and its dependencies, on condition, however, that the patents should not be turned over to any of the existing telegraph companies, which might throttle the whole proposition and not develop and improve the system as Poulsen took a pride in having done. Mr. Elwell organized a company and built stations at Sacramento and Stockton. After the possibilities of the system had been successfully demonstrated by these stations, Mr. Beach Thompson and other San Francisco capitalists became interested in the proposition and spent a large sum of money in building new stations and carrying on experimental work for over a year. At the end of that time they became convinced of its merits, and of the fact that successful and reliable communication by wireless over land at all times, and over practical commercial distances, was at last possible. "Freak" messages sent over great distances are frequently made mention of in the papers, but the possibility of sending such messages may occur only once a month or once a year, which makes them of no value for commercial purposes.

Accordingly the Poulsen Wireless Corporation of Arizona was organized in October, 1910, and later the Federal Telegraph Com-



San Francisco Station, Forty-eighth Avenue, between L and M Streets pany, which is a California corporation, the Poulsen Wireless Corporation owning all of the stock of the Federal Telegraph Company. The officers and directors of both companies, who are all San Francisco men, are as follows:

Beach Thompson, President; E. W. Hopkins, Vice-President; H. P. Veeder, Secretary and Treasurer; C. F. Elwell, Chief Engineer; John F. Deahl J. Henry Meyer, Chas. D. Marx, Carl Philip, George A. Pope, S. E. Slade.

The Company at present has offices and wireless telegraph stations in the following cities:

Seattle and Roche Harbor, Washington; Portland and Medford, Oregon; San Francisco, Sacramento, Stockton, Los Angeles and San Diego, California; Phoenix, Arizona; El Paso, Dallas and Fort Worth, Texas; Kansas City, Missouri; Chicago, Illinois.

The Company, however, has the entire rights for the United States and all of its dependencies, including Alaska, the Hawaiian Islands, the Philippines, Porto Rico, and also Cuba.

In San Francisco the Company's present wireless station is located close to the Ocean Boulevard, about one-half mile south of Golden Gate Park. The towers sustaining the antenna are of the Howe Truss type and are 300 feet in height, the material is wood, and the towers are uniformly six feet square from base to top. In the operating house there is installed both a 12-kilowatt and a 30-kilowatt Poulsen generator, together with the receiving panels and other apparatus necessary for the use of either generator. This allows one of the generators to be always in reserve. The current required for the use of these Poulsen generators is 600 volts direct current. This is supplied by the installation of a 50-horsepower motor-generator set, which is installed in a separate power house and which changes the 220-volt alternating current supplied from the mains of the Pacific Gas and Electric Company to the 600-volt direct current needed. There is also a spare motor-generator set of the same capacity.

The antenna at the San Francisco station has a total length of about 21,000 feet of wire. The wire used is seven-strand phosphor bronze, which is especially strong and durable.

A new station is in the course of construc-

Steel tower on roof of building at Chicago, twenty-four stories tion at San Bruno Point, near South San Francisco, which will have the loftiest towers of any station in the world and which will be among the two or three most powerful as to capacity. The two masts at this station are triangular in shape, instead of square, and are also of wood, the sides being six feet in width. The towers will be 600 feet apart and each mast will be supported by eight sets of guys having three cables in each set. There will be a total of 35,000 feet of antenna wire suspended between these towers, which will make it by far the largest antenna of its type ever constructed. It will also be of seven-strand bronze wire.

The station will be rated as a 30-kilowatt station and will have two complete sets of 30-kilowatt Poulsen generators, one set to be kept in reserve. There will also be motor-generator sets in duplicate to change the alternating current supplied by the Pacific Gas and Electric Company to the 600-volt direct current employed by this system. The total area covered by the masts, guys and antenna will be about 25 acres.

While the Poulsen system has been adopted by the German, Danish and Austrian governments for all naval and military purposes, the telegraph business in these and other European countries is handled as a government monopoly, and for this reason the commercial development of this system to the fullest extent of its wonderful possibilities, will be made in the United States.

"Snow-Plane," the Latest Air Vehicle

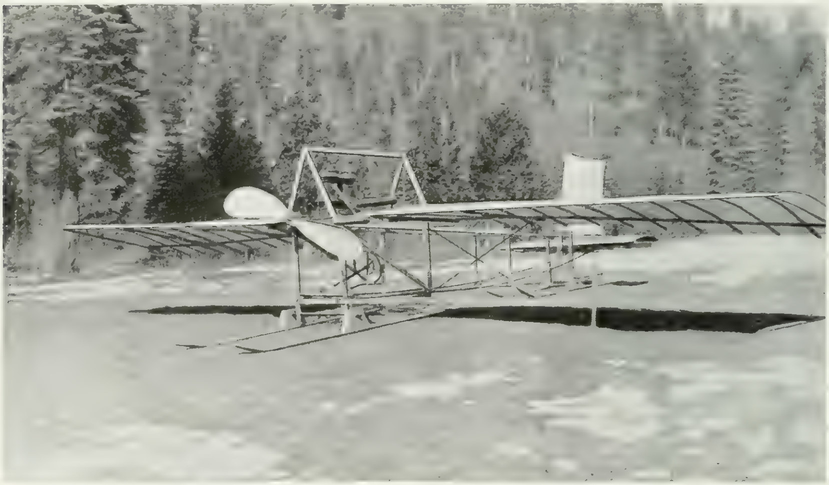
By GEO. R. OSTERMANN, Operator Deer Creek Power House.

G R Ostermann

It is far from anywhere up at Deer Creek. Picturesquely situated as it is in the heart of the mountains east of Nevada City, life at this power station is one long communion with nature. It is healthy to a degree. The air breathes vitality, and during the hours of work and play alike the operator attached to "Pacific Service" feels his veins throb with an energy that the city man, I imagine, would give a good deal to experience.

Taking out, then, the necessary hours of sleep, there is a feeling up here that one must be up and doing all the time. I certainly have felt the magic influence of atmosphere, and that is perhaps why I have been using the glorious hours of the day between sleep and work in making things with my hands.

Readers of the April number of the Pacific Gas and Electric Magazine were told how the employees of the Deer Creek power house resorted to skis in winter-time to enable them to travel over the snow. I have done some ski-running and with more or less success, but during the winter now past it occurred to me to build a snow-plane, or monoplane, to which the starting impulse should be given by gliding over the snow. The result I now present to the reader. The machine resembles an ordinary monoplane, having a spread of wings twenty-six feet in length from tip to tip, the wings being five feet in depth. The body is fifteen feet long and tapers from two and one-half feet at the front to one foot at the rear. It is square in form, built of spruce and bamboo. The horizontal rudder is 6 by 3 feet, and the vertical rudder 4 by 3 feet. The

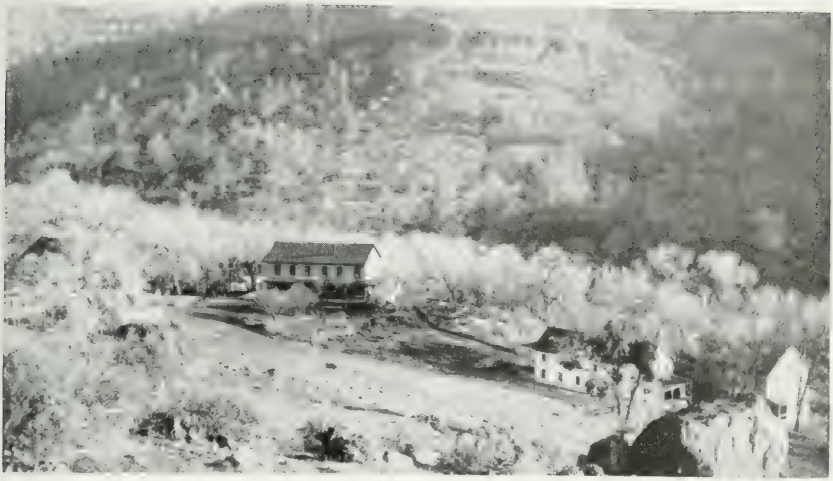


machine rests on four skis, or snow-shoes, the two front ones being eight feet long and three feet part, and the rear ones six feet long and one foot apart.

Up here at Deer Creek it is usual to have enough snow to cover up the brush and make the hill-sides fairly smooth, so that when the snow has a hard crust an ideal condition for starting a glider exists, but although the glider is finished the necessary snow has failed to arrive. It was intended to take the plane up the hillside and slide down until enough speed was obtained to raise the plane from the snow and allow it to soar.

I regret very much that I cannot give herewith the result of any practical experimenting in what I call snow-planing. Perhaps next winter will allow us to add some real discoveries to aeronautic science. In the meantime I venture to think that my invention may interest the readers of the magazine not a little.

For the purpose of a real aeroplane picture a dummy engine and propeller were constructed. These, of course, would not be used in gliding.



Richardson Springs, near Chico, Butte County

Natural Gas at Richardson Springs

By H. B. HERYFORD, Manager, Chico District.

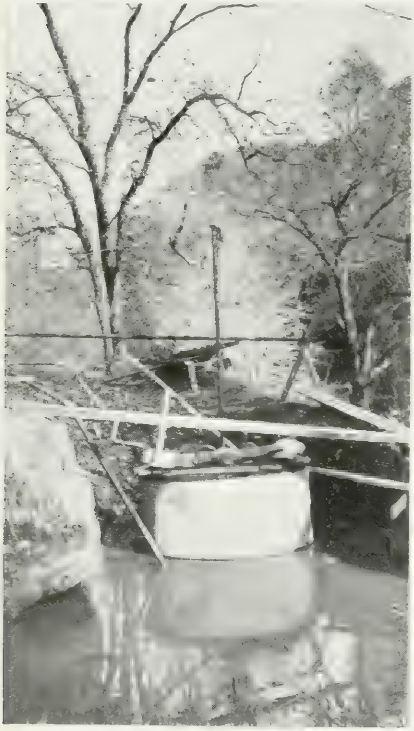
H. B Heryford

Richardson Springs are situated about ten miles north of Chico, in Butte County, in the high foothills of the Sierra Nevada Mountains, and are noted for their mineral water. They attract many visitors from all parts of the country. Their mineral properties are the result of contact with chemical accumulations established long ago through seismic action and volcanic disturbances.

Mud Creek, a few miles above the springs, winds its course through the rugged canyons and passes just a few hundred feet south of the springs. It is here that natural gas is found. Its existence has been known for a long time, but only during the last year developments have been made to utilize it for domestic purposes.

The main well, from which gas is supplied to the buildings, is about three-quarters of a mile below the springs in the bed of the creek. The well is about twenty-five feet deep and extends into the porous bed-rock from which the flow of gas comes, and the distributing agent is a two-inch pipe. A 2,000-gallon water tank, turned up side down and sealed with the water of the well as indicated in the illustration is used for a holder. There is about 1,000 pounds weight of rock on the tank which gives the gas about an eleven-inch pressure. The gas flows into the tank from the well, and if not utilized as fast as it comes will escape through the bottom.

The flow of this well is estimated at 3,000 cubic feet in twenty-four hours, this small figure probably being attributable to the shallowness of the well. Steps are now being taken to further develop it and install a gas holder of 10,000 cubic feet, which will insure the springs a constant supply. This natural gas is now being used at the springs for lighting purposes as well as heating the main building, and as soon as further developments are made it will be utilized for cooking in the hotel and for service in the cottages roundabout. It is hardly probable, however, that it will be found in large enough quantities for commercial purposes.



The Well at the Springs

About fifteen years ago several parties undertook to drill for oil at the springs and a well was bored about 600 feet deep. But such difficulty was encountered that the enterprise had to be abandoned. Natural gas was struck in large quantities at the depth of about 200 feet, but as the springs were not open to the public at the time no developments were made. The gas was shut off by the casing and was not struck again in going down to the 600-foot mark, where the formation was solid stone. Several weeks were spent in trying to penetrate this substance, for the prospectors entertained hopes of striking the oil they were seeking underneath; but the drilling process of those days was slow as compared to the improved methods of the present and the facilities for handling the drill were not good, and as a result the drill and some small tools were lost and the efforts of the prospectors were blocked.

Dynamite was resorted to but without success, as the lower part of the foundation caved in and made the situation worse than it was before.

It is probable, however, that oil exists in this locality, and there is talk of another attempt in the near future. In their renewed search for this the prospectors intend to keep a close look-out for a possible flow of natural gas. In the event of their striking this, they will take care not to cut it off by the casing in sinking the well, as happened on the previous occasion. If gas should be struck it is the intention to utilize it at the Springs and bore for oil in another direction.

The H. W. Johns-Manville Company announces that it has acquired the Sole Selling Agency for the entire products of I. P. Frink.

"Frink" reflectors and fixtures need no introduction to the lighting trade and consumers throughout the country, and this arrangement means that the H. W. Johns-Manville Company will be in position to design and sell lighting systems for every known form of artificial illumination.

An Engineering Department will be maintained along very extensive lines. This Department will maintain a corps of Engineers throughout the United States and Canada, and be equipped to place data and recommendations in the hands of all interested in any subject pertaining to illumination.

Authorized Additions and Improvements

BERKELEY DISTRICT

Work has been commenced on the reconstruction and re-arrangement of tie-in lines for the general improvement of service in this District.

COLUSA DISTRICT

Eleven kilovolt line has been extended to supply pumping service to Davis and Stone Ranch.

GRASS VALLEY DISTRICT

A new washer of the ammonia type has been installed at the Gas Works.

MARIN DISTRICT

Work has been commenced for the extension of a high-pressure gas main from San Rafael to Larkspur.

MARYSVILLE DISTRICT

Eleven-kilovolt line has been extended to supply the Arboga Colony Tract in Yuba County, the initial installation being 150 horsepower for pumping purposes.

NEVADA POWER DIVISION

Eleven-kilovolt line has been extended to the California-Montana Mine in order to supplant the present water-power service with electric power.

A new automobile has been purchased for the use of Division Superintendent Scarfe.

An automobile has been purchased for the use of Mr. E. H. Steele, Superintendent of Construction.

OAKLAND DISTRICT

Six-inch main on Grove Street has been extended from Forty-seventh to Sixty-second Street, in order to improve our service in that locality owing to its rapid growth.

Extensions of our 6-inch and 4-inch gas mains are being made to take care of additional consumers in the town of Richmond.

Work has been commenced on the reconstruction of the 11-kilovolt tie lines and the construction of additional tie lines to take care of the increasing load in this District.

Considerable work has been done in both the Gas and Electric Departments in order to take care of the growing demands for our service in this District during the past month.

PETALUMA DISTRICT

Under the terms of our contract with the City of Petaluma, a series Tungsten street lighting system is being installed.

SACRAMENTO POWER DIVISION

Five miles of 11-kilovolt line has been constructed to take care of the additional pumping plants along the Alder Creek Consumues Line.

SAN FRANCISCO DISTRICT

Work has been commenced on the installation of a street lighting system in the Panhandle of Golden Gate Park.

An automobile has been purchased for the use of our Gas Arc Department.

Our Gas, Electric and Steam Departments are experiencing busy days, owing to increasing demands for our service in this District.

SAN JOSE DISTRICT

Considerable work has been done in this District in connection with the extension of our 11-kilovolt lines in order to furnish service for the greatly increasing pumping load in this District.

SANTA ROSA DISTRICT

Work has been commenced on the reconstruction of our distributing lines at Sebastopol and the installation of a series Tungsten street lighting system.

SOLANO POWER DIVISION

Eleven-kilovolt line has been extended from the Davis Substation to Putah Creek, in order to supply increasing pumping load.

STANISLAUS DISTRICT

Work has been commenced on the installation of street lighting system in the town of Patterson.

An automobile has been purchased for the use of Manager Wiedenmann, in order to facilitate the handling of business in this District.

ITEMS OF GENERAL INTEREST

A fair example of the reliable quality of "Pacific Service" is afforded by the new installation in process of completion at Davis, Yolo County, where the Pacific Gas and Electric Company is building an addition to its new substation to house two machines that will handle 4,000 volts single-phase electric current for the Southern Pacific Company's block signal system east and west of the town.

The railroad company has been using batteries to operate its block signals heretofore, but the change to electric power supplied from outside is expected to give better results as well as working a saving in expense. Poles to carry the current are now being erected along the railroad line.

The particular point of value in this to electric power enterprise is that a railroad needs absolutely continuous service, as a failure of electric power for even a few minutes might bring about serious results. The fact, therefore, that the Southern Pacific Company has entered into this contract with "Pacific Service" shows the perfect confidence the former has in the latter's ability to live up to the terms of its adopted slogan.

George E. Betten, ditch tender in the Company's employ in the Gold Run District, reported to the Southern Pacific Company's agent the discovery of a broken frog on the wye at Gold Run, and also a slide of earth and rocks that occurred east of Magra on May 25th. His prompt action in reporting these obstructions was appreciated by Mr. H. W. Sheridan, Superintendent of the Sacramento Division, who wrote him a personal letter of thanks, at the same time forwarding a copy to the head office of the Pacific Gas and Electric Company. Mr. Britton at once wrote Mr. Betten on the matter, stating:

This is to assure you on behalf of the Pacific Gas and Electric Company, that such actions on the part of its employes are fully appreciated by us."

In the official report of the Oakland District for the week ending June 10th, the following interest item of news appears:

"This has been Cherry Carnival week at San Leandro. We put in a demonstration at our office there Saturday afternoon and night; we baked cherry pie for free distribution. One of our boys dressed up as a French chef, and with a suitable decorated automobile and megaphone paraded town in the early evening, announcing free cherry pie cooked by gas at the Gas Office."

From the modern Athens on the opposite side of San Francisco Bay comes word of a satisfied customer of "Pacific Service," who comes forward to publish to the world her gratification at the discovery that among public service corporations, as well as among friends, confidence begets confidence.

Manager Frank A. Leach received the following communication the other day, which is well worthy of publicity:

"San Francisco, June 8, 1912.

"Pacific Gas and Electric Company,
"13th and Clay Sts., Oakland.

"Gentlemen:

"Found: An honest corporation! And to think that no one ever suspected it! Joking aside, I thank you very much for your discovery of error in my previous gas bill, and note (is it necessary to say 'with pleasure'?) that I still have a credit of 27 cents on gas. I enclose herewith check for $1.00 of S. S. McCahill, endorsed to your order, in payment of electricity, as per enclosed bills, which please mail to my residence, 5609 Genoa Street, Oakland, after receipting, and oblige,

"Yours very truly,
(Signed) "Mrs. M. E. Wolfe."

Members of the Pacific Gas Association have received a second notice calling their attention to the Twentieth Annual Convention of the Association, to be held in San Diego, September 17th and 19th, inclusive.

In this second notice sent out by Secretary Britton the following warning appears:

"Your failure to be in attendance at this convention can only redound to your individual loss. The papers which are now being prepared for presentation to this convention will be of more than passing interest to the gas fraternity at large, and cannot help but bring forth discussions which will send you home wiser men."

It is given out that one of the principal topics for discussion by the convention will be the proposed establishment of a Gas Engineering course of study in the University of California, in which students may graduate as in mining or civil engineering.

"Pacific Service" was well to the fore at the National Electric Light Association Convention at Seattle. Of the twenty-two representatives of the Pacific Gas and Electric Company on the ground, there was hardly one who did not make his presence known among the electrical wise men of the country.

Mr. Britton, as stated elsewhere, took part in several important discussions, and the members of his staff followed his lead in committees and various technical and other sessions during the convention days.

Stanley V. Walton, Paul M. Downing, H. P. Pitts, A. R. Thompson, Geo. C. Robb, Lee H. Newbert and J. D. Butler were all conspicuous in discussions concerning their respective fields of enterprise.

Mr. Butler took particular interest in the accounting sessions and more than once gave his Eastern brethren some valuable pointers on system, which they received with a good deal of appreciation.

"I find that our methods and ideas on accounting at least equal to those of our brethren from the East, Middle West and North West," said the veteran Auditor of the San Francisco District, in giving his views of the convention.

There was considerable excitement at Seattle on the day before the convention opened, when the West surpassed the East at baseball with a score of 16 to 3. It was voted afterwards that the West owed its success to the "Golden Poppy" contingent. Mr. Ralph Phelps as "Yell Leader" proved himself a most artistic booster, if one may be permitted to use such a term in connection with the national pastime of America.

From the capital City of Sacramento, Manager McKillip sends word of some extensions and improvements of the street railroad system there, which is owned and operated by "Pacific Service." The P Street line from Tenth to Twenty-eighth, is being reconstructed, the old 35-lb. T rail being replaced by 87-lb. groove rails. The foundation is of rock, and Manager McKillip announces that the construction is 50-year, class "A."

It is announced also that a new car-line is in process of construction from Twenty-first and P Streets to Twenty-first and K Streets, then down K to Fifteenth Street, connecting with the track at Fifteenth and K. This is also class "A" construction.

There is an ingenious advertising device on view at the Company's office at San Mateo which is well worth looking at. The legend "Cook with gas" has been worked out with glass thumb-tacks and paper-fasteners on a background of black plush-covered board. Mr. W. L. Johnstone, the able young clerk in charge of the office, is responsible for the idea which has resulted in an original piece of work that when lighted up at night is very effective.

Manager Florence, of the Redwood District, is a busy man these days, installing gas and electricity in country homes and providing farmers with juice for irrigating purposes. Among his triumphs in the former connection are the homes of Miss Jennie Crocker and Mr. Jos. D. Grant, in the hills back of San Mateo, and that of Mr. Stanley Mosshead at Woodside. In the latter district the Family Farm has come under "Pacific Service," and, in fact, the entire Portola Valley.

In the farming line the greater part of the installations have been made in the Sunnyvale District. Manager Florence reports 1700 horsepower connected up since this time last year, and contracts are still coming in.

Electric Heating in Sweden

Electric heating is not new in Sweden, and satisfactory apparatus has been on the market for some time, but both first cost and current consumption have hereto been to great to bring about anything like extensive use. Well-informed critics here estimate that electric heating cannot be made as cheap as ordinary heating until the current can be delivered for 5 ore ($0.0134) per kilowatt hour. This is one of the points it is hoped to clear up by the experiments to be undertaken by the municipality.

There is a portable tile stove for electric heating on the market that is claimed to be as effective as the stoves in which fuel is burned. The makers state that their usual size is about 100x50x30 centimeters (39.37 by 19.685 by 11.811 inches) and has a capacity of 1.5 kilowatts. This, they state, will raise the temperature in a room of thirty cubic meters (39.24 cubic yards) capacity to 10 degrees Cel. (18 degrees Fahr.) in one hour. After the room has been heated the stove may be switched to another set of connections using less current. It is claimed that the cost of operation on highest current requirement in Gothenburg is 27 ore ($0.0724) per hour, while the lower connections to which it can be switched cost 14 ore ($0.3752) and 7 ore ($0.0188) respectively.

The town of Boras, which has about 21,000 inhabitants, is considering the sale at very low prices, by the municipal electric plant, of current for household use along similar lines. It is planned to have three tariffs—one in force during the darker part of the twenty-four hours, with usual charges, for lighting purpose; a lower one (4 to 6 ore, equivalent to $0.0107 to $0.0161 per kilowatt hour) for current used for cooking purposes; and a very low rate (2 to 2½ ore, equivalent to $0.0054 to $0.00674) during the night for current used to warm rooms and houses by heating up the Swedish porcelain stoves or operating electric heaters of other designs.

The tile stoves for fuel consumption are usually ornamental. Some are cylindrical and some are square or triangular. These are not portable, but are built into the houses and form a part of the permanent fixtures that go with every rented apartment. When it is considered that a nine-room apartment will often contain nine of these stoves, costing $26.80 to $53.60 each and over, it will be readily seen how much their utilization for electric heating would mean. Both alternating and direct current are furnished, the rates per kilowatt-hour being now as follows: For lighting, $0.0938; for elevators, $0.067; for motors and power, $0.0482.

PERSONALS

Mr. D. H. Foote, our genial Secretary and Assistant Treasurer, is just home from a six weeks' sojourn in the effete East. Mr Foote went to New York to sign the $20,000,000 permanent bonds that were sold to the house of J. Pierpont Morgan & Co. last December, and for which temporary bonds were given at the time of the sale. In addition to his other titles, Mr. Foote bears that of Third Vice-President of the Pacific Gas and Electric Company, and it was in the latter capacity that he signed his name, on an average, one thousand times a day during his period of labor in the Eastern metropolis.

"It was quite a job," said Mr. Foote on his return. "Those bonds had to be signed, delivered and exchanged before the first coupon fell due on the first of July. I took them in bunches as they were ready for me. One day I signed 3,500. Try it sometime if you have any idea that it's easy."

Mr. Foote met some of the big financial men of the East during his sojourn there. He was pleased to find "Pacific Service" very well spoken of. The officials of the Bankers Trust Company, trustee of the $20,000,000 mortgage, not only expressed themselves absolutely satisfied with the security given therefor, but, to quote Mr. Foote, "They told me that not another company they did business with had its papers in so satisfactory a shape as ours. 'You people evidently are on to your job,' they said."

Mr. Foote took the opportunity to visit relatives at Portland, Maine. On his way home he stopped off at Chicago, where he saw Mr. Samuel Insull, who expressed himself very much pleased with his recent trip to the Coast and much impressed with "Pacific Service," its personnel, its activities, and its general condition.

Vice-President and General Manager John A. Britton took a trip Sierra-wards over the Fourth, and went over the ground of the company's projected extensions of its hydroelectric system on the Bear and South Yuba Rivers.

Mr. Britton had with him Manager Geo. C. Holberton, of the San Francisco District, also Assistant General Manager Jas. H. Wise. They had an enjoyable as well as a useful trip. The work to be done includes the construction of two power plants on Bear River, with an initial installation of 40,000 kilowatts and a potential development of over double that amount; also the conversion of Lake Spaulding into a big reservoir of 3,500,000,000 gallons capacity. Only last week the State Railroad Commission gave its official sanction to the projected improvements.

The Sacramento office is about to lose one of its best trusted employes. Miss Hattie Logan leaves the Company on the first of August, after nearly eight years' service in the Bookkeeping Department.

Dan Cupid has been invading the Stockton Water District. A. J. Pierce, Operator at Pumping Station No. 2, was united in the bonds of matrimony to Mrs. Ellen Wolff, on May 25th, and on July 2nd Claire V. Wilbur, Inspector, wedded Miss Bess V. Pritchard.

Miss E. Walsh, formerly employed in the Closing Bill Division of the Collection Department, has resigned and will be married to Mr. Neil Murphy, of the Purchasing Department, on July 17th.

Pacific Gas and Electric Magazine

PUBLISHED IN THE INTEREST OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON - - - - Editor-in-Chief
FREDERICK S. MYRTLE - - Managing Editor
A. F. HOCKENBEAMER - - Business Manager

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

Vol. IV JULY, 1912 No. 2

EDITORIAL

The National Electric Light Association Convention at Seattle proved a decidedly beneficial experience to us men of the West who went there to see and hear and take part in the deliberations of the most representative assemblage of its kind to be found in the United States.

Matters transpired there which went far to reassure us and cheer us on our way, for in the addresses made and discussions had by the brightest intellects in the light and power business of the country there was enough to show us that the same problems which are agitating us now and for years and months past have been, are engaging the attention of one and all of those older communities beyond the Rockies that have had the advantage of early settlement and organized development.

There was a good deal said at Seattle on the subject of the relations of the public service corporations to the public, and in this connection one sentiment may be accepted as the unqualified opinion of one and all of those men whose wide experience and unquestioned standing in their respective communities entitle them to be heard with the utmost respect, namely, that the only satisfactory way to deal with a public utility is to establish it as a well regulated monopoly.

There were no two opinions about that, and if there had been present at the hearings a Citizen's Committee or a body of men representative of the masses that up to the present appear to have been led to believe that in competition lies the people's safeguard, they would have heard things calculated to turn their views in an entirely different direction.

It was the consensus of opinion that the public interests are best served by giving public service companies a monopoly in the territories they cover; that competition destroys existing values and makes public service enterprise of uncertain stability; that it is a question of economy pure and simple; that the generation and distribution of electric energy can be most economically done by the concentration of production and distribution, the only way to get the best results out of the investment and, at the same time, give the general public what it is always looking for, the best possible service at the best possible rates.

From the other end of the continent comes a corroborative opinion delivered by Ex-Governor Stokes of New Jersey at the recent annual meeting of the Gas Association of that State. Governor Stokes has studied the public service problem from the ground up and it was by special invitation of the Association that he was called upon to deliver an address in which he treated the public utility question with all the skill of a master. Upon this question of competition he said:

"The sentiment regarding the granting of franchises has undergone a decided change within the last decade. Formerly the public wanted competition; today they want regulation. I am not orthodox on a good many subjects, and I never was orthodox on the subject of competition. I do not believe in competition. I think that the greatest ill that ever befell the human race commercially was that after dinner remark of Adam Smith, that competition is the life of trade.

"Competition is not the life of trade; it is the death of trade; and it means, if carried to its logical conclusion, the injury or the ruin of or the down-fall of some or all of your competitors. Otherwise it is not competition."

In support of his point Governor Stokes quoted from a recent decision of the Public Utilities Commission of New Jersey where in passing upon an application for a local franchise the Commission held that competition except in rare instances was not a public benefit; that what the public needed was constructive regulation rather than destructive competition.

The New Jersey statesman voiced the opinion that one of the best ways to instill into the minds of the public a feeling of confidence in the public service corporation operating within its territory was by publicity of the open and candid description. He voiced the following precepts as summing up the philosophy of public life as well as of individual life:

"Some one said that silence under unjust accusation is finely poetic, but a protest at the right time is effective.

"Corporations that remain silent under the geehaw lash of the business-baiter have their silence pointed out as a proof of guilt.

"The world accepts a man at the value he places on himself. To let the misinformed expound and explain to the public and you yourself make no sign, is to allow the falsehood to pass as current coin. And soon it becomes legal tender. According to the common law of England, a path across your property that is once used by the people becomes theirs for all time.

"It is not the thing itself that lives, it is what is said about it.

"You must advertise wisely and discreetly so as to create public opinion that is favorable to you."

Pursuing this line of thought, Governor Stokes urged this upon his hearers: Your patrons depend upon you absolutely for the character of what you sell and they must accept your account as verity. In this kind of relation the value of the service rendered is more appreciated than it is where the vendor or seller and the purchaser are upon equal terms. And so a gas company that makes evident its desire to please, to serve the public, to render the best service possible, to remedy every just complaint, and to look after even unjust and unreasonable complaints, to ask its patrons if they are satisfied and for suggestions of betterments, such a company as that creates the impression that the patron is their chief concern; and when you have once created that impression and gotten the confidence of your patrons and the public, then the relations between you and your patrons are always friendly and cordial."

Does not this go to show that in regard to the public service question the situation is the same all over the country? "Pacific Service" has realized it. Indeed the Pacific Gas and Electric Company was perhaps the first of the great public service corporations of the West to step forward into the open and say to the public it serves: "We are here to do the best for you that is in us. We have an investment to protect, but we ask no more than a fair and equitable return upon our investment. We have nothing to conceal. We ask you to take an interest in us and in our works. If you will listen to us we will tell you what we do and how we do it, and you may follow our undertaking in its various phases and developments from the very beginning if you will. This is a mutual undertaking for the mutual benefit of our organization and its patrons."

The result of this policy is already making itself manifest. The old days of distrust and suspicion are over. A new order of things has been established both by law and custom, and it is safe to say that ere long the ghost of the public service corporation bugaboo will have been laid.

Keep your face always toward the sunshine and the shadows will always fall behind you.

Noting Progress of the World's Fair

PROGRESS in the work of constructing the Panama-Pacific International Exposition is gradually reaching a point where it will be visible to the naked eye.

Seventy buildings have been removed from the site at Harbor View and it is promised that by the end of July there will be not a structure nor an encumbrance left standing. There are still a few pieces of property East and West of Laguna Street to be acquired, but condemnation suits are being rushed so that the Building and Grounds Department may not be delayed in its work.

A second dredger, the "Oakland," has been brought to the assistance of the "John McMullin" in filling in the overflow lands. The two are working night and day and are pumping nearly 20,000 cubic yards of silt from the bay each twenty-four hours. The work of filling in is expected to be completed within sixty days.

There is to be a 9-foot board fence around the Fair site, which will be two and a half miles in length. Bids will be called for as soon as the City authorities close the streets on the Exposition site. The construction of the seawall is almost completed, more than 15,000 cubic yards of stone having been hauled to the site by the contractors.

The past month has been a busy one for the Exposition directors. Kentucky, Illinois, Pennsylvania and Arizona were added to the list of States that have selected sites for their buildings. The number now has reached fifteen. Twenty-nine other States have appointed Commissioners to come to San Francisco and select sites. Compared with other expositions this showing is considered remarkable.

Japan will be the first foreign country to select its site for a National building. This will be in the latter part of the current month.

Illinois State Commissioners dedicating site for their State Building, June 24, 1912

Dumping rock on the Breakwater at Harbor View

Agents from the Dominion of Canada have been here and that country is already preparing to participate in the good work.

Governor Judson Harmon of Ohio proposes to visit California some time in the early part of September. In a letter to Director Thornwell Mullally, Ohio's governor says:

"You have my permission to announce that if my present plans do not miscarry I shall visit California some time during the forepart of September. You may be certain that the wonders of your State and City and the magnificent Exposition which you are to build have not suffered in their presentation by Mr. Herring, who during your contest a year since, as well as in his interest today, displays all the loyalty and ardor of a Californian. The great Commonwealth of Ohio has given ten thousand of her very best people to the citizenship of your State, and when I visit you I shall feel as one who comes among his people. I know your Exposition will serve as a means of uniting more strongly the bonds of sympathy between your State and mine."

By invitation of President Moore a meeting of County Supervisors and Commissioners from the interior of California was held in San Francisco on June 20th. It was a highly successful gathering, no less than 47 counties being represented. The most important feature of their deliberations was a resolution to petition the State Legislature to appropriate the sum of $1,000,000 for a State building to house the State and County exhibits.

The hotel men of San Francisco have evidenced their confidence in California's great undertaking by pledging themselves to raise the sum of $100,000 in addition to the $150,000 already subscribed to the fund. The year 1915 promises to be a great one for the hotel business in this part of the world.

The Flying Legion of Exposition Boosters is about to get busy again. A trip to Victoria, B. C. is planned for the latter part of August. The organization has received a cordial invitation from the Mayor and citizens of the British settlement and an elaborate plan of entertainment is in course of preparation. It is expected that President Moore and Mayor Rolph will accompany the delegation to the British territory.

Thirty of the foremost literary men of America are to be here in August as the guests of the Exposition. They are invited to come here and see the situation for themselves, so that when they return East they may send out to the world words of cheer and encouragement that will have the true ring to them.

There were doings in San Francisco on the first of July in connection with the Eleventh Biennial Convention of the General Federation of Women's Clubs. The Exposition directors got up a special program of sight-seeing, and a feature of the exercises was the planting of a laurel tree in Lobos Park by Mrs. Phillip North Moore, President of the Federation, and its consecration to the Panama-Pacific Exposition. The delegates were taken out in sight-seeing cars and automobiles to view the Exposition site and at the conclusion of the ceremonies an invitation was extended to all to return to San Francisco in 1915.

President Moore has called upon the Native Daughters of the Golden West to plant trees of their own and ship them to the Exposition a year hence. When the tree planting ceremonies were held during the recent anniversary of the N. D. G. W. at San Francisco, the delegates to the Grand Parlor were requested to take this matter up. The trees which the Native Daughters will send will be in the Forestry Division and each will bear the name of the Parlor sending it.

Dredger at its new berth at Harbor View site

What the Press Has to Say

Doing Wonders at Santa Cruz

Citizens Regard Light and Power Service Afforded Them as Best on Coast

If Santa Cruz will look back and consider the electric light and power service this city and county has received this year since March, they will realize that this service has been well nigh perfect. And there's a reason. The Pacific Gas & Electric Co., from which the Coast Counties Gas & Electric Co. get their power through the Davenport substation, have spent a great deal of money in the improvement of that particular substation. In fact of all the substations, controlled by this mammoth concern, including those around San Francisco, the one at Davenport is recognized as being the largest of its kind. Oakland may have many more substations, for instance than has this station, with its one, but not one of those stations is equal to that at Davenport.

The Pacific Gas & Electric Co. has become one of the greatest power concerns in the entire country, securing its power from eleven different water plants in the Sierra Nevada watershed. In the distribution of that power to consumers 4,500 men, all told, are employed. The Coast Counties Gas & Electric Co. is simply one of the numerous companies purchasing power in wholesale quantities from the larger concern, and we who purchase power from the local company have the satisfaction of knowing that the service we are now receiving, and have been receiving since March, is equal to the best in the State.

The main line extends from Mountain View to Davenport. To reach Santa Cruz from the latter point the line, bearing 22,000 volts, extends through Ben Lomond, tapping Brookdale, etc., through the powder mills to Santa Cruz. The line continues on to Gilroy. At the present time the Pacific Gas & Electric Co. is busy building a new extension down the valley from San Jose to Gilroy, to thus make a circuit with the present line. This extension will be completed in July, and with it, whenever there is a breakdown anywhere along the Davenport line, all the operator will have to do will be to make a simple turn on his switchboard and we will be getting all of our power over the Gilroy line, instead of via Davenport.

In an interview with A. S. Hawley, foreman of the Davenport substation this official stated he thought we could not expect in the future any better service than we have been getting since March of this year, but to have such service as this in the winter months when storms are at work breaking down lines and playing general havoc will be a condition much to be desired and hereafter possible.

The current reaches Oakland by several main lines down the Sacramento valley, and now it will have two means of coming from Oakland to this city.

The substation at Davenport is worthy of inspection, although it is not open to the general public during the absence of Foreman Hawley, without his permission. Mr. Hawley has had charge of the Davenport branch, which supplies this county, ever since the inception of that branch five years ago, and an inspection of his work is a prompt indication of his efficiency. The plant there has been enlarged three times since he took it in charge. He has but three men under him, and there is a man on duty every minute out of the 24 hours. The building is forty by sixty feet in size, absolutely fireproof, of concrete construction. If any fire should break out there a relay switch would immediately automatically stop all the machinery. Every precaution is made for the safety of the men employed. The building houses eleven transformers of an average weight of eight ton apiece. The plant has a capacity of 16,000 horsepower. The machine itself weighs 56 tons. The roter weighs 27 tons and travels at the rate of 300 revolutions a minute. The plant automatically holds the voltage steady no matter what that voltage, within a certain range, might have been desired. Switching is there done on 60,000 volts with the current on.

The Pacific Gas & Electric Co. was founded by John Martin and Eugene de Sabla in a small way, but by rapid extensions, enlargements and absorption it has grown to be one of the wonders of the West.

Santa Cruz (Cal.) *Sentinel*, June 11, 1912.

Company Wins in Oakland

Modern Athens Once More Comes in Under "Pacific Service" for Gas and Electricity

Following a lengthy discussion between representatives of the Central Oakland Light and Power Company and the Pacific Gas and Electric Company as to which had actually presented the most advantageous bids for street lighting and the lighting of public buildings in lighting district No. 5, the city council last evening awarded the contract for the street and building lighting of the entire city to the Pacific Gas and Electric Company for the coming fiscal year. The street lighting bill is the highest item in the annual budget in the maintenance division, and for the year just closing the expenditure was over $150,000.

Competition between the two companies reduced this lighting from $12,000 to $15,000 for the coming fiscal year 1912-1913 below the $150,000 figure for the twelve months ending at the close of this month. To facilitate competitive bidding by so drawing the specifications that the newer company might enter proposals for those sections of the city in which it has gained a foothold, the city was districted by City Electrician George Babcock, and individual bids asked for in each district.

The Central Oakland concern was able to enter the competition only where disrict 5 was concerned, and here the Pacific Gas and Electric made reductions in its proposals under the cost of lighting in the same territory for the previous year of about $9,000. Reductions made as a result of competition in this district for street lighting, and in the city at large for the lighting of public buildings will amount to between $12,000 and $15,000.

Frank A. Leach, Jr., manager of the Pacific Gas and Electric for the Oakland division, pointed out that the company, in its dealings with this community, was deserving of some consideration, as it had voluntarily reduced rates from year to year when there was no competition.

"As fast as more scientific methods and more economical equipment made it possible, the Pacific Gas and Electric, and its predecessor, the Oakland Gas Light and Heat Company, made reductions in the rates to the city. This was done voluntarily and without the pressure of competition. We are entitled to some consideration from the city on this ground. Last year we voluntarily reduced our bid so that there was a saving of $5,000. The year previous our reductions saved you $10,000, and the year before that $4,000 or $5,000."

Upon this showing and the recommendation of Commissioner of Public Health and Safety Fred C. Turner, a resolution was passed awarding the entire contract for all districts, including No. 5, to the Pacific Gas and Electric for the coming fiscal year.

Oakland (Cal.) *Tribune*, June 1, 1912.

Gas for South Vallejo

South Vallejo is to get gas service immediately, President Britton of the Pacific Gas & Electric Company, who was here yesterday attending the session of the Railroad Commission, having assured Mayor Tormey that he would grant the South Enders petition for an extension of the service.

Vallejo (Cal.) *Chronicle*, June 1, 1912.

Rates to be Preserved

Accepting the figures of the Pacific Gas and Electric Company, which had been carefully checked up by City Expert E. M. Ray as a basis for computation, the city council has decided to continue the present rates charged by that company in force as the municipal rate maximum chargeable to consumers, and two ordinances have been drawn up and practically approved by the council, establishing the rates for gas and electricity for the coming fiscal year, 1912-1913.

Oakland (Cal.) *Tribune*, June 5, 1912.

Bonds to be Redeemed

The $4,000,000 debenture 6 per cent bonds of the Pacific Gas and Electric company, dated 1907, will be redeemed at par and accrued interest in New York today at the Equitable Trust company. About half the issue is held locally and half in the east. Notice that the bonds would be redeemed today was given last January. It is expected that most of the bond money will be available for reinvestment.

A meeting of the directors of the Pacific Gas and Electric company will be held here at noon today, and the regular quarterly dividend of $1.25 declared. Pacific Gas and Electric common sold at $64.62½ yesterday, which is stronger than its price has been recently.

San Francisco (Cal.) *Call*, June 15, 1912.

Ho, For Electric Chicks!

PETALUMA, June 13.—The Pacific Gas and Electric Company has extended the electric light service in the vicinity of the rural districts to supply the hundreds of poultry ranches in the vicinity with light and power. The advent of the electricity is causing much rejoicing among the poultry raisers, who will use the electric juice exclusively in operating the big hatcheries and brooder plants.

San Francisco (Cal.) *Examiner*, June 15, 1912.

Reasons for Sliding Scale

The reason for the sliding scale for electric current resulting in lower rates for manufacturers than to resident consumers, was explained to the Rotary Club by George C. Holberton, manager of the San Francisco district of the Pacific Gas and Electric Company, at a luncheon yesterday.

Holberton said that the rate charged was based largely on the "peak of the load," that is the amount of current required for the period of maximum demand. This occurs early in the evening, the principal demand being for lighting.

Unlike gas, electricity can not be stored in any quantity, said Holberton. The company's equipment must be capable of supplying the maximum demand all the time, even though during the day the demand for current is comparatively light. The rate for residence lighting at the "peak of the load," is based on a reasonable return for the capital invested in the whole plant.

Business rates, largely for manufacturing purposes during the day, were lower for two reasons, said the speaker. First, the demand was light, not requiring the full equipment, and second, an equalized rate, in which manufacturing rates and lighting rates would be the same, would increase the manufacturing cost to a prohibitive figure.

The elimination of manufacturing current, following the raising of the rates, would in the end tend to increase the lighting rate. The furnishing of current during the dull periods at a reduced figure was to bring up the "load factor," or ratio of average consumption to maximum demand.

Equalizing the lighting rate during the "peak of the load," and the manufacturing rate during the dull period, asserted Holberton, would paralyze industry, as the manufacturer could not pay beyond a certain figure and realize a profit on his goods.

San Francisco (Cal.) *Chronicle*, June 26, 1912.

Extensions in Petaluma District

The Pacific Gas & Electric Company has decided to extend its electric service from the Santa Rosa main road just north of town, along the Skillman Lane for its full length to its intersection with Magnolia Avenue and thence along that avenue for considerable distance. Also along the unnamed lane which leads to the big poultry plant conducted by Japanese, the extension being a long one and one which will accommodate many residents along that thickly settled local suburb. The company decided upon this action fully two weeks ago and the work is already under way and it is thought that street lights will be installed in the near future by the residents along the new territory.

Nearly all of the territory of the new extension has already been piped for gas and many of the poultrymen are using gas for their brooders, so that with gas and electricity they have all of the utilities and conveniences of a city.

Petaluma (Cal.) *Argus*, June 12, 1912.

Demonstration Car Popular

On Friday and Saturday, May 31st, and June 1st, the demonstration car of the Pacific Gas & Electric Company will be in Yuba City and through trained lecturers and practical users of electricity the company will demonstrate to the public the many and important uses to which the power may be applied and instruct the patrons of the company in the ways of using the service at the least cost.

In the car are booths where the power and light is applied to all classes of farming, horticulture and dairying, to the kitchen and living apartments of the home. Half of the car is devoted to irrigation and half to farm machinery and home use. Ice-making with one of the smallest ice machines in use will be exhibited. The machine has one-sixth of a ton capacity. In the car will be shown how the service may be applied to sewing machines, cream separators and washing machines. The many uses of the services in the kitchen and living rooms of the home will be shown.

It will be worth the time spent for every one, who can, to visit the car on one of these days. Visitors will be shown every courtesy.

Yuba City (Cal.) *Independent*, May 30, 1912.

Beginning Work on Dam

ALTA, (Placer Co.) May 28.—The Pacific Gas and Electric Company this morning started a force of men at work clearing a right of way for the power line which is to be run from the Alta power house to Lake Spaulding. This line is to furnish power for the machinery to be used in the construction of the new dam, work on which has already commenced.

The building of the new dam will take at least a year's work, and upon completion the storage capacity of the company's water system will be nearly doubled, according to the estimation of the engineering department. This is the beginning of a large amount of improvement work which is to follow.

The company has in contemplation a new ditch to be built on the Nevada County side of Bear River to do away with the numerous flumes on the present Boardman ditch, and also to develop power for a power house to be built at the base of Camel's Hump, between Lowell Hill and Little York. This new ditch system has been surveyed and it is understood that it has been favorably reported on. It is planned to concrete the entire ditch in order to eliminate loss by leakage, and a plan has also been taken under advisement of covering the ditch for some miles at the head, where the snowfall is heavy during the Winter months.

As soon as this work can be fully started, employment will be furnished to a large force of men.

Sacramento (Cal.) *Bee*, May 28, 1912.

PACIFIC GAS AND ELECTRIC COMPANY

DIRECTORS

F. B. Anderson
Henry E. Bothin
John A. Britton
W. H. Crocker
E. J. De Sabla, Jr.
F. G. Drum
John S. Drum
D. H. Foote
Wm. G. Henshaw
A. F. Hockenbeamer
Samuel Insull
John Martin
C. O. G. Miller
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J. H. Hunt	Purchasing Agent
E. B. Henley	Manager Land Dept.
J. P. Coghlan	Manager Claims Dept.
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Chico	Chico	H. B. Heryford
Colusa	Colusa	L. H. Hartsock
Contra Costa	Martinez	Don C. Ray
Fresno	Fresno	W. M. Henderson
Grass Valley	Grass Valley	John Werry
Marysville	Marysville	J. E. Poingdestre
Marin	San Rafael	W. H. Foster
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Placer	East Auburn	H. M. Cooper
Redwood	Redwood City	E. W. Florence
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PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	187	1,081,222
Gas	49	978,167
Water	10	45,825
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
[2] Albany	800
Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Broderick	200
Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corde Madero	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
Dobbins	50
Davenport	1,000
Drytown	20
Durham	500
Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
[2] Emeryville	5,000
Encinal	100
Fairfax	500

Place	Population
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
Ione	900
Irvington	1,000
Jackson Gate	100
Jackson	2,035
Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Martinez	5,000
Martell	150
[2] Marysville	7,000
Mayfield	1,500
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
[2] Palo Alto	6,300

Place	Population
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Vacaville	1,200
[2] Vallejo	15,000
Walnut Crek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Yolo	400
[2] Yuba City	1,200
Total	1,136,222

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,500 people.
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30 of California's 56 counties.
An area of 37,950 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

PACIFIC GAS AND ELECTRIC MAGAZINE

PACIFIC GAS AND ELECTRIC COMPANY
PACIFIC
COURTEOUS
CONTINUOUS
SERVICE

Published Monthly by
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SAN FRANCISCO

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VIEW ON TRAIL TO POWER-HOUSE SITE

"WINTER TO WINTER, 1915"

ASSOCIATED OIL COMPANY

GENERAL OFFICE
Wells Fargo Building
San Francisco

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Pacific Gas and Electric Magazine

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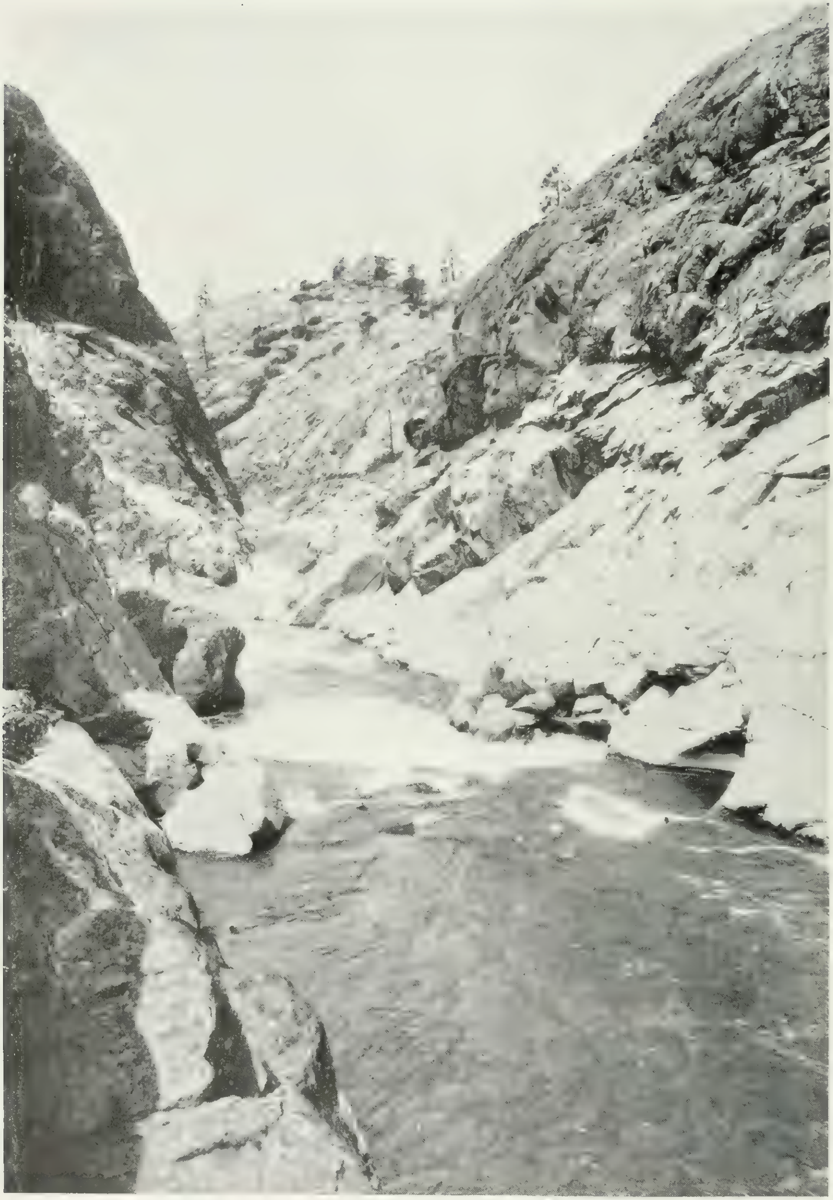


SHOWING WHERE THE GREAT DAM WILL STOP THE WATERS OF THE YUBA RIVER.

Attention is called to the buttresses of rock on either side against which the concrete structure, 300 feet high, will rest. It will be the greatest dam of its kind in the world.

PACIFIC GAS AND ELECTRIC MAGAZINE

VOL. IV AUGUST, 1912 No. 3

The Newest and Greatest "Pacific Service" Undertaking; the South Yuba and Bear River Hydro-Electric Development

By JAMES H. WISE, Assistant General Manager.

Jas. H Wise

For the benefit of the employees of the Pacific Gas and Electric Company and other readers of this magazine, the writer will outline briefly the hydro-electric project on the south fork of the Yuba and Bear Rivers, which has been in contemplation for some time, but on which active work was not begun until permission was received from the Railroad Commission on July 3d.

The development makes use, for power purposes, of the water already impounded in twenty reservoirs in the catchment area of the South Yuba, having a capacity of 2,024,000,000 cubic feet, combined with additional storage of 4,000,000,000 cubic feet, to be secured at Lake Spaulding. The water thus stored is to be diverted, together with the natural run-off, to the Bear River water shed, conducting it in tunnels and canals along the south side of the Bear River Canyon to a point about three miles northeast of Towle Station on the Southern Pacific, to a regulating reservoir known as the "Drum Forebay." Two riveted steel pipe lines will lead from this reservoir to the power house 1,350 feet lower in elevation, and situated on Bear River, where an installation of 40,000 kilowatts, consisting of four units, will be erected, together with the necessary transformers, exciters, governors, and other adequate equipment to make the entire installation complete. Electric power from this plant will be transmitted at 115,000 volts on a double circuit steel tower line, extending in a southwesterly direction via Nicolaus to Cordelia, the load center of the Pacific Gas and Electric Co. At this point step-down transformers will be used for reducing the pressure to approximately 60,000 volts, permitting the power thus to be transmitted to various parts of the system: Oakland, Berkeley, Alameda, San Rafael, Santa Rosa, Vallejo, Petaluma, and northward toward Suisun, Cement, Woodland, Sacramento, Davis, Dixon, and, in fact, to any part of the vast territory already covered by the 60,000-volt network of transmission lines.

The project further includes the construction of a steel tower line from Cordelia to San Rafael, Sausalito and Lime Point, thus providing Pacific Service to the Marin peninsula and the transmission of hydro-electric power ultimately to San Francisco.

Adverting to Lake Spaulding, this splendid reservoir site, with a capacity of 4,000,000,000 cubic feet, or nearly double the

Looking toward the dam site from up stream

combined capacity of all of the reservoirs in the South Yuba system, will be formed by the construction of a huge monolith of cyclopean concrete. The dam will be of a gravity type section, arched upstream for an additional factor of safety and a more substantial type of construction, thus insuring stability and absolute security against any possible failure. The dam will be 300 feet in height and will be built somewhat similar to the New Croton and Croton Falls dams of the New York Water Supply, and of cross section, approximating the Roosevelt Dam, which impounds such a vast quantity of water for the Salt River project, a part of the reclamation work of the United States Government. The reservoir is situated about two miles northeast of Smart Station, on the Southern Pacific Railroad, at an elevation of 4,600 feet. The proximity of the site to the main line of the Southern Pacific is indeed fortunate and a spur track directly to the location of the dam will greatly facilitate and economize the work. This track has already been constructed and work on the cableways, sand and gravel bunkers and tunnel outlet is now rapidly progressing.

In connection with this work at Lake Spaulding, not the least important is the operation of the old Birce & Smart sawmill, now owned by the Pacific Gas and Electric Company. The high dam will flood 700 acres of land which now contains over 1,000,000 board feet of standing timber, which the mill has been converting into ties, boards and dimension stuff at the rate of from twenty to thirty thousand board feet of lumber per day. There is already a good stock of lumber on hand for the work as it progresses. The clearing of the reservoir site will therefore be practically completed and, at the same time, a most valuable use of the timber will be made. Any surplus will be used in the maintenance and repairs of the many flumes on the South Yuba system. A solid rock concrete-lined tunnel, 4,427 feet long, will form the reservoir outlet and will conduct the water to the upper end of a concrete-lined canal 8½ miles in length, having a capacity of 400 second feet, or 16,000 miners' inches. This canal will contain no flumes but will have a short syphon near the lower end leading to the forebay previously mentioned. The regulating reservoir site is a large flat area capable of being converted into a forebay of 400 acre feet capacity without excessive cost, and will thus provide sufficient water to run the entire plant for twenty-four hours, and will amply provide for peak load and other power fluctuations—a most valuable adjunct to a plant of this size and importance.

The forebay will be constructed by excavating the earth and loose material from the basin, forming a dam about 35 feet in height on the south or lower side of the slope. The earth embankment will be made according to the most approved methods, namely, by placing the material in thin layers, thoroughly dampening, rolling and compacting, thus making the dam absolutely impervious. Two riveted steel pipe lines leading from this regulating reservoir will be 6,300 feet long and 72 inches in diameter at the upper end. The lower end will be provided with "Y" branches, castings and suitable gates and nozzles for conducting the water to the eight water wheels, each with a capacity of 9,000 horsepower. The pressure at the nozzle of

Where the tunnel will end and the canal begin the 7-inch stream impinging upon the water wheel buckets will be 585 pounds per square inch, or nearly three times the high steam pressure used by the big locomotives of the Southern Pacific Co.

That this work, both in the field and office, is most actively carried on is shown by the fact that the plans and specifications of the water wheels, generators, transformers, steel towers, and pipe lines are already in the hands of the manufacturers, and bids will be received by the time this magazine goes to press. Excavation for the power house foundations began immediately upon securing the necessary permission from the Railroad Commission, and camps were established along the canal line from the Lake Spaulding Dam to the forebay. At the power house sites at this time 1,400 men are busily engaged in clearing, excavating and carrying on the many phases of work necessary to a project of this kind, while the engineers of the company have been for months preparing all necessary details, plans and specifications for each and every individual part of the equipment for the necessary prosecution and construction of the work, as well as the large units which will be used in the final operation of the completed plant. The canal line for its entire length has already been cleared of all brush and trees, and excavation is actively in progress. The forebay site has been cleared of all loose material and objectionable surface earth which could not be used in the main body of the embankment, and some three hundred head of stock and one hundred and

Blasting the rock for the railroad to the dam site fifty men are now actively carrying on the excavating and placing of the earth for the embankment.

Preliminary and final surveys and many of the rights-of-way have been already secured for the 118-mile transmission line from the Drum Power House to Cordelia, and work on the foundations for this line will begun within a few weeks, so that the towers can be installed, assembled and erected in the early spring of 1913, thus insuring and guaranteeing completion of the line before the fall of next year, which will witness, without doubt, the final completion of the entire project. We are all working hard to that end.

Admirable From Every Viewpoint; Would Bear Still Greater Development

By HERMANN SCHUSSLER, Hydraulic Engineer.

Mr. Schussler needs no introduction to the readers of the Pacific Gas and Electric Magazine. For nearly a lifetime he has been in the service of the Spring Valley Water Company, first as Chief Engineer of Construction, and now as Consulting Engineer. His indorsement of the Lake Spaulding project is more than valuable at this time. [ED.]

Last week it was my good fortune to accompany Mr. J. A Britton, Vice President and General Manager, and Mr. J. H. Wise, the Engineer, of the Pacific Gas and Electric Company, to the site of the large storage Reservoir which the latter company proposes to construct on the site of the old reservoir there, known as "Lake Spaulding."

The dam which the company proposes to construct will be located a short distance down stream from Lake Spaulding; and, owing to its contemplated height of 300 feet above the bed of the river, the above original reservoir will be entirely submerged. While the length of the proposed dam will be only 60 feet at the bottom of the gorge, its length along the finished curved top will be 900 feet.

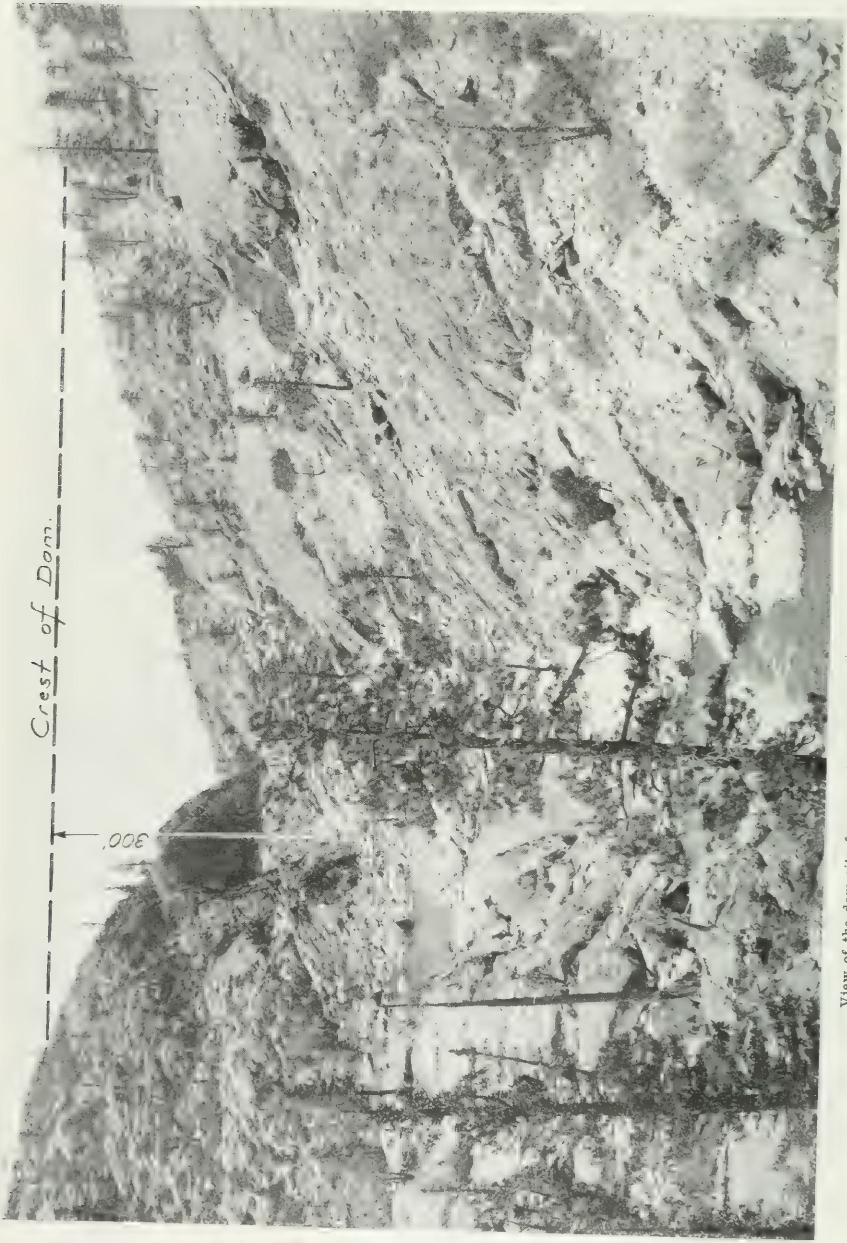
The reservoir to be created by the erection of the new dam will have a surface area of about 700 acres, and a storage capacity of 4,000 million cubic feet or 30,000 million gallons.

The watershed directly tributary to the reservoir has an area of fully 120 square miles with an average annual rainfall of between 60 and 70 inches.

Owing to the generally rocky and precipitous character of the water shed, the percentage which the seasonal surface runoff bears to the gross precipitation on the watershed will be fully 50%.

Thus, the average, annual water product discharging from the above watershed into the proposed new Lake Spaulding will be equal to fully 8,000 million cubic feet or 60,000 million gallons, or double the storage capacity of the proposed reservoir.

By the construction of the proposed main concrete dam across the gorge of the South Yuba, the water surface of the proposed storage reservoir will be raised to such a height that it will be necessary to construct at two points of the divide on the northerly side of the lake two separate, comparatively low concrete dams. One or both of these,



View of the dam site from up stream, showing the elevation to be reached by the waters of the lake will be so arranged that they will form capacious waste-weirs, or spillways, for such waters as will have to be wasted from the reservoir when the latter—during or immediately after the snow-melting season—has been filled to its utmost capacity. By the construction of these spillways the necessity of discharging such waste-waters over the top of the high main concrete dam will be avoided.

The hydrographic features, thus briefly outlined, show that the reliability and constancy of the water supply from this source will be practically ideal.

In fact, I should be very much tempted—in spite of the already great height of 300 feet of the contemplated main dam—to still further increase the same, in order to bring the storage capacity more nearly up to the average annual water product of the tributary watershed—if it were not for the necessity of having also to raise at considerable cost the two above mentioned subsidiary lower spillway-dams.

The ideal location of the proposed main dam in the precipitous narrow gorge of the Yuba, with its practically homogeneous rock bluffs on both sides of the river, fully excuses and justifies my above expressed desire of increasing the height of the dam above the contemplated height of 300 feet.

When, about seven years ago, I stood—like last week—on the rock bluff, the main body of which will form the southerly abutment of the proposed arch-shaped dam, I could not help feeling and expressing delight at seeing one of the most admirably formed dam sites, that I had ever beheld—admirable both from a topographical as well as geological point of view.

The dam, in all probability will be built with the system of interlocking, Keystone

Camp Boardman, a ditch camp below Bear Lake

Sluicing for gold where the monitor does its work

shaped concrete blocks—built in place alternately—containing not less than 400 cubic yards each—and similar to the dam built by me in San Mateo County, where it forms the large Crystal Springs Reservoir of the Spring Valley Water Company. This same method was successfully employed in the construction of the large Barren-Jack dam in Australia.

The successful manner in which the above main Crystal Springs concrete dam resisted the tremendous wrenching to which it was subjected by the earthquake of April 18th, 1906—although located close to the main fault-line—fully proved that the method of construction adopted by me, coupled with the first-class materials and thorough workmanship employed in its erection, fully justified the great care bestowed upon every portion of this important work.

The rock required for the concrete for the new Lake Spaulding dam—estimated at between 250,000 and 300,000 cubic yards of concrete—will be quarried out of or near the bluff over-topping the southerly abutment of the same, while the necessary gravel and sand is found of excellent sharp-grained quality and in great abundance, in a large nearby moraine—a remnant of the glacial period.

The successful construction and completion of the proposed new concrete dam for the greater Lake Spaulding—owing to its great height as well as its great economic value for developing the resources of our State, will not only reflect great credit upon the company that had the foresight and boldness to undertake this magnificent work—but also upon the engineering talent employed in its conception, design and successful construction.

Nature Anticipates Man's Handiwork

By FREDERICK S. MYRTLE, Publicity Manager.

F. S. Myrtle

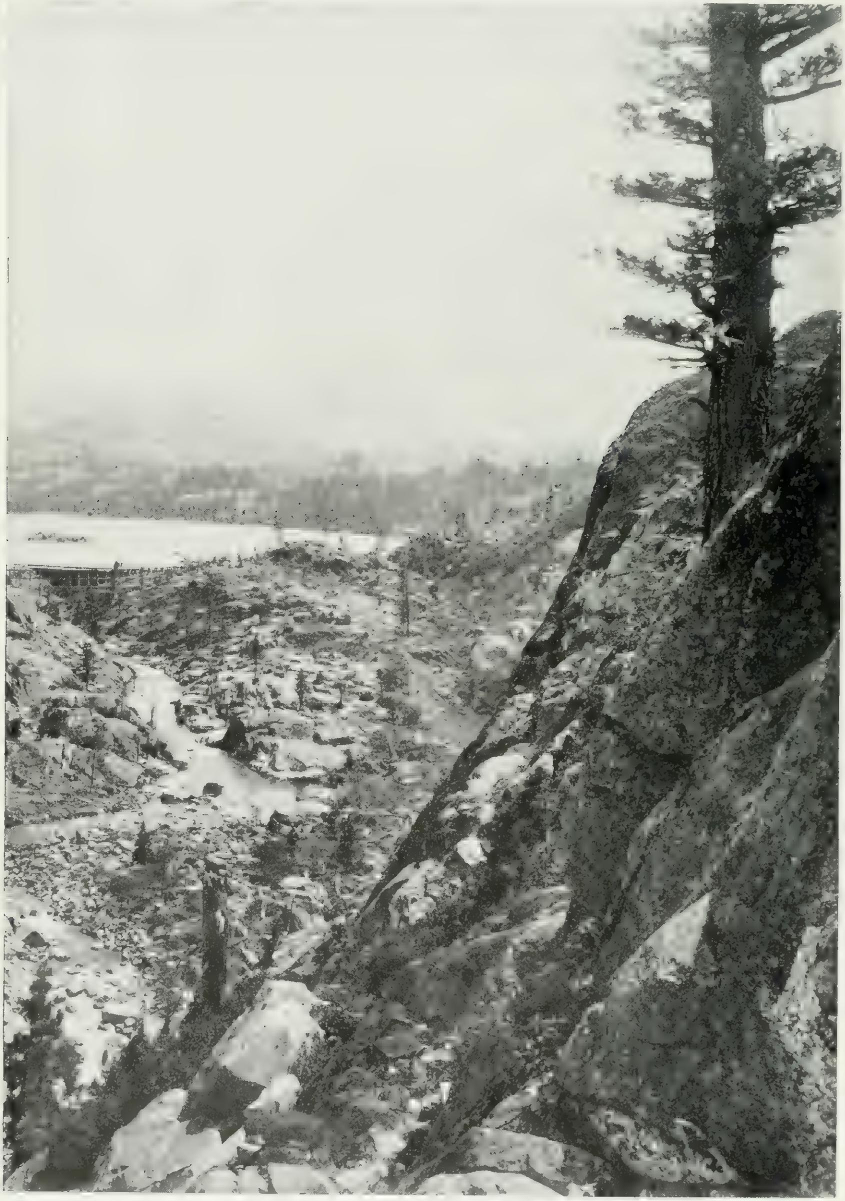
It's a wondrous, marvelous proposition. One doesn't need to be an engineer to see that. Dame Nature has planned it, has furnished the groundwork; man will do the rest.

Imagine a great bowl of rock scooped out of the mountain tops, with a narrow gorge at either end through which the snow-waters flow unceasingly. Picture to yourself at the lower end great buttresses of rock rising from either bank of the river to a height of several hundred feet as though jealously guarding the outlet of the stream. Doesn't the idea of constructing a dam there suggest itself at once?

This suggestion is not intended to detract from the skill and ingenuity of the more than capable engineers who are responsible for the details of this great development that will mean upwards of 100,000 horsepower to our hydro-electric system. It is calculated, rather, to impress upon the minds of our readers the wonderful success that must be the outcome of the project. It means, in effect, that Dame Nature has been more than generous, and that what she has given with so lavish a hand, man will accept and make the most of according to his powers.

Accompanied by a small corps of camera artists I paid a visit to the scene of the South Yuba-Bear River development in the early

Logging Lake Spaulding. All this lumber is used in construction work



From the rocks below the lake. When the dam is built the water will reach a point above the rock to the extreme right of the picture.

Laying rails while you wait. A trestle on the broad-gauge road

part of July, and what I saw up there accounts for my present enthusiasm. My first experience was when I boarded the evening train at the Oakland Mole. I had a ticket for Smart and I told the Pullman conductor I wished to be awakened in time to get out there. There ensued a discussion as to where my station was located.

"It is this side of Emigrant Gap" said the Pullman man.

I hastened to assure him to the contrary. I knew better, I said, and I didn't want to get up any earlier than was absolutely necessary. Presently the train conductor came along. When the situation was explained to him he said:

"Oh! I know Smart. It is in the snowsheds. It used to be a place once, but that was long ago. By the way, I am taking people up there every night now by this train. What's doing there?"

I explained and the conductor understood. It had worried him for some time, he said, to see so many up-to-date looking persons demanding to be let off at a place he supposed had gone out with the pioneer days.

Our party arrived very early in the morning and making all speed down the spur track that runs from the station in the snow-sheds to the old Smart mill, found ourselves in a very little while at Camp No. 1, the company's headquarters at the Lake Spaulding end of the construction scheme. It is quite a camp. They house and feed and take care of some 275 men there now, and the number is increasing daily. It is like any other construction camp in appearance. It consists of rows of tents, with a few luxuries, such as a barber shop, an emergency hospital and a commissary store. It is in charge of Mr. Dougald Henry Duncanson, General Superintendent of Construction, who is about as competent a man at his game as can be found in the country. The engineers' offices are there at present, though there are new ones being constructed on the lakeside. The Auditing Department has fourteen men engaged there, and, last but not least, there are three deputy sheriffs on hand to keep order among the men.

Mr. Duncanson gave us a cordial welcome and led us at once to the breakfast table, where we enjoyed wholesome fare and plenty of it. "Pacific Service" evidently doesn't propose to underfeed its men. I wish you who read this article could all breathe that fine, keen mountain air that is furnished gratis to the dwellers by Lake Spaulding, and then you would know what it is to eat of camp fare and, like Oliver Twist, ask for more.

After breakfast we started on our work of inspection. We walked down the broad-gauge track which is being laid while you wait, so to speak, from the Smart spur to the dam site, a distance of about two and a half miles; and we had the pleasure of taking part in the first ride over a brand-new trestle. We saw some men drilling and blasting the way in front of us.

"We will be running over there before nightfall' said Mr. Duncanson with smiling, easy confidence. Then he went into technical description of trestle work, and I gained much valuable information about stringers, mudsills, caps, posts and sills.

Presently we hove in sight of the lake, and a gorgeous sight it was. It will be more gorgeous in a year or two. We looked across

Superintendent Duncanson precedes a train over a new trestle

Corral on Forebay reservoir, where 130 head of horses are stalled

it and we saw the old landmarks of placer mining days, Grouse Ridge, Red and Black Mountains, and Old Man Mountain, and the remains of Flannery Diggings, a once famous placer mine. We looked upon an adjacent eminence and we were told that was the site of the company's proposed clubhouse, a place of rest for the company's employees exclusively. There they will be given opportunity to enjoy the dolce far niente that is the only complete freedom from care, and pass their days at leisure in fishing for the most delicious mountain trout that ever graced a millionaire's breakfast table. It was hard to realize that when this club-house is built the rock supporting it will be an island. Yet so it will be. Lake Spaulding dam is to be three hundred feet high, you know, and that means something even against a wall of mountain rock.

The whole presented a great picture, and looking back along our tracks we saw the snow-sheds, a black seam against the hillsides, somewhat resembling a gigantic flume in the perspective.

General Foreman George Burnside came along, and being introduced, pointed out the way down to the lake. It was a hard scramble over rock and scrub brush, but it had to be done. Evan Magnuson, lake tender at Spaulding for the last seventeen or eighteen years, led the way, and we envied him his goatlike precision of foot. In the riverbed below the present dam they are logging just now and will be for some time. Where the waters of the lake will lie when the project is completed there are forests of trees, all of which have to come down. As fast as they are cut they are logged by means of a donkey-engine and train and drawn up to the Smart Mill, which has come into its own again and is grinding away night and day cutting up the lumber for construction purposes. At the site of the present dam there is more logging going on, the lumber being hauled out of a boom upon the lake. The rest of the new lake's surface consists of brush, all of which will be burned.

While we stood in the riverbed we beheld the site of the new dam within a few yards of us, and we saw what Nature had provided. It is almost a cul-de-sac, a pocket of rocks, as it were, so that both foundation and supports are already there.

Mr. Magnuson, who is a sturdy Norwegian, took me to his home by the lake side. It has been his home for many years, but he has been served with notice to quit. He will have to move a few hundred feet higher up if he wants to be high and dry when the new Lake Spaulding takes the place of the old. We had lunch at Camp No. 3, cozy quarters nestling by the lakeside. More excellent food and plenty of it. And by the way, do you all know the delight of copious draughts of clear, fresh mountain water after a hot morning spent in clambering over rocky eminences?

I made the circuit of the lake twice during the afternoon in a gasoline launch belonging to the company. There are trees sticking out of the water. All that is to be changed in the new construction scheme. The new lake will have a bed of earth and rock devoid of obstruction of any kind, for the new plan contemplates the supplying of towns of Placer and adjoining counties with water for drinking purposes.

We learned much that day and took many good pictures. Next morning we started down the pole line. Less than a mile out of headquarters we came to Camp No. 2, built at the

Old Narrow-gauge trestle which will come in handy just now

Where the tunnel is to be bored 4,600 feet through the rock to the dam

spot where the 4,427 foot tunnel will emerge from its long bed of rock and pour into the canal leading down to the forebay. J. N. Thomas, an old mining man, is in charge here and is building himself cosy quarters. This is one camp that will be in full operation during the winter when the snows come and impede surface-work. The men will be underground boring the tunnel, and they expect to complete it before the spring sunshine brings life to the Sierras again.

After telling me that the tunnel will be oval in shape and will be 8½ feet high and 11½ feet wide, Thomas pointed down to the tunnel outlet and said: "There is 5,000 horsepower there if they want to use it."

Our road took us through other camps in course of construction and in about five miles brought us to where Superintendent James Martin of Colfax Water District assumes jurisdiction with his ditch camps. The Bear Valley camp at the upper end of the lake of that name is picturesquely situated in a meadow, and has a reputation for good cooking. There are one hundred and fifty men located there at present. Camp Boardman, named after the old South Yuba ditch which is seen against the hillside to the north, lies at the lower end of Bear Lake, and is a good specimen of a clean, well-conducted camp. We took lunch there.

Early in the afternoon we arrived at the scene of the new hydro-electric development, Camp Forebay. Here again Nature has been more than generous. There is a sort of plateau at the summit of the ridge which separates Bear Valley from the line of the Southern Pacific, and it seems to have been ordained by Nature for the purpose to which it is to be put, namely, a regulating reservoir. They are busy clearing the site, with the aid of about one hundred and forty horses and scrapers, stripping off the surface of loose earth. This reservoir when completed will be an eighteen-acre lake. Below this eminence lies Camp Forebay, which takes care of three hundred and fifty men, including teamsters, laborers and carpenters, ably run by Jim Martin.

You have been told by Mr. Wise how it is proposed to run two pipes from Forebay Reservoir to a manifold, the site of which has been provided by Nature at a ledge some distance down the steep incline leading from the edge of the ridge to the riverbed some 1,350 feet below. When the project was first started the engineers had to clamber up and down this precipice as best they could, but now a zig-zag trail has been cut and one may reach the powerhouse site in comparative comfort. A pack train of mules goes up and down at regular intervals, commanded by John Wiley, a veteran at the game, who is said to pack a mule better than any man living. Of course the big interest at the lower end of this great construction scheme is the hydraulic monitor which is playing upon the rock and rubbish in the riverbed. The gorge is so narrow down there that for once Dame Nature has failed, for she has provided no natural powerhouse site. It is left to man to make one, and the hydraulic monitor, a resuscitated relic of by-gone days, is doing the trick. The man in charge is J. C. Hussey, an old hydraulic miner, who handles his monitor as lovingly as an expert whip his reins.

The scenery at what will be known as the Drum powerhouse is wild and very beautiful. When completed this system for picturesques-

J. C. Hussey operating the hydraulic monitor

The old Smart Mill again in active operation

ness as well as for magnitude will be the strongest feature in the Pacific Gas and Electric Company's scheme of operations.

I should mention here that there is some railroading being done at this end of the operations, for a branch of the Southern Pacific is being constructed from Orel, a station near Blue Canon, to camp Forebay, three miles. This promises to be a very interesting piece of railroad construction work, for it will be of standard equipment and will include three switch-backs. Then there is to be an independent line running up to the Forebay Reservoir, carrying supplies and things.

What I give you here is a bird's eye view of the situation. I propose to go up there again from time to time as the work progresses, and I do not expect to find my stock of enthusiasm diminished to the slightest extent by repetition. If I had a "White Hope" I wanted to send against Nigger Johnson, I would put him to work up there under the pines for awhile and let him breathe that air and drink of that water and clamber up and down those precipices. I would guarantee his wind, if nothing else, when he got through his training. There's health in every minute of life in that region.

Where the narrow-gauge train takes logs from lake to mill

Noting Progress of the World's Fair

JOHN BRISBEN WALKER, Director of Exploitation of the Panama-Pacific Exposition, makes the following statement regarding progress:

"The history of no Exposition has been marked by such rapid work as that which has followed the official recognition of the City of San Fancisco by Act of Congress. It will be but a short time until San Francisco will begin to reap the fruits of prosperity which will follow the active work of construction of the Exposition buildings. It is estimated that as soon as the work of the Exposition is under full way, some 17,000 men will be employed within the grounds.

"All this getting ready for such an undertaking must be done slowly and with the utmost care if miscalculations are to be avoided and no back steps taken. Every step has been difficult to men who, although ablest of the able in business, with but one exception have been inexperienced in Exposition affairs. But everything has been done with deliberation and care, and so wisely that it meets the approval of the experts. It is true today that no previous Exposition has been so far advanced at so early a date."

To gain an appreciable idea of what has been done, one should visit the Harbor View site. The tract of 71 acres of tide-lands extending from the foot of Webster Street as far west as the Fulton Iron Works has been filled in and one may now walk over the so-called tide-lands with dry feet. Up to July 15th, seventy-five buildings had been removed from the site and that work is progressing rapidly to a conclusion.

The work of constructing a sea-wall has been completed, and it is now a question of building a nine-foot fence around the Exposition grounds. Plans for a Service Building, one of the first structures to be erected on the site, have been practically completed, and drawings are being prepared for groups of minor buildings between the Fillmore Street entrance and the entrance to the Amusement Concessions. The Engineering Department is working on plans for the operation of a sewer system, and these will be completed in a very little while. Working plans for a fresh water system and a fire protection system are under way.

Japan stands pioneer of the foreign nations of the world to select the site for its exhibit. Commissioners from the land of the Rising Sun have been in San Francisco since the middle of July, the location has been picked out, and before this issue of the Pacific Gas and Electric Magazine goes forth from the press the formal ceremonies will have been held. Meanwhile the list of states that have selected their locations is growing. The Cleveland Grays have been here from Ohio and Governor Judson Harmon and his Commission are expected early in September to conduct the necessary ceremonies of site-selection.

Mayor Gaynor of New York has accepted the invitation of the Exposition Directors to visit here, and there will be great doings in his honor.

Within the past few weeks State and Foreign Societies have been organized in San Francisco by New England, Illinois, Wisconsin, Arizona, Ohio, Pennsylvania, Missouri, Georgia, Colorado, New York, Minnesota, North Carolina, Louisiana, Germany, Great Britain, Canada, France, Italy, Portugal, Spain, Sweden, Norway, Holland, Denmark and Servia, with a view to interesting the various governments they represent in Exposition participation. Other State and Foreign societies have been formed, so that in time the natives of all the governments of the world will become affiliated with this great undertaking. These societies will take charge of exploitation and publicity at home by means of letters, postal cards and printed matter, and their members are expected to exercise considerable influence on the legislative bodies in the matter of obtaining handsome appropriations for their adequate representation in the Exposition.

Karl Bitter at work

Photo by J. B. Landfield

Mr. William T. Sesnon, Vice-President of the San Francisco Chamber of Commerce and a member of the World's Fair Commission appointed by President Taft to visit the courts of Europe, returned last month after a very successful sojourn on the Continent. He speaks most enthusiastically of conditions as he found them, and is emphatic in the declaration of his opinion that the great European powers will spare neither trouble nor expense to bring about their worthy representation in the great International Celebration of 1915.

President Taft has appointed Lieutenant Commander David Foote Sellers, a very distinguished officer, to act as naval aide to President Moore. Commander Sellers is on the ground and has already assumed his duties.

President Moore has made the following appointments: Jules Guerin, Director of

Color; A. S. Calder, Chief of Structures; Karl Bitter, Adviser in Sculpture; E. E. Carpenter, Civil Engineer; A. H. Mark, Chief of Construction. All are well-known men. Guerin is the foremost mural decorator of this country. Bitter, whose picture is given here, was Director of Sculpture at the Pan-American Exposition at Buffalo, and also at the St. Louis Exposition.

The British residents of San Francisco have authorized Consul-General Carnegie Ross to communicate with the authorities at home without delay, suggesting the advisability of selecting a site for the British exhibit at as early a date as possible.

The Exposition already boasts a flagpole. It is a present from the citizens of Astoria and was sent down to San Francisco on one of the giant rafts of the Hammond Lumber Company. Its dimensions as given by an expert timber scaler are as follows:

Douglas fir, a perfect piece of timber; base 56 inches, top 23 inches, length over all 246 feet, cubic contents 1,958.52 feet, contents 25,515.46 solid lumber feet, estimated weight 93,061 pounds. A picture of the massive pole is given herewith.

The "Flying Legion" of Panama-Pacific boosters is organizing its excursion to Victoria in response to the cordial invitation extended by the Mayor and citizens of the British settlement in the Pacific Northwest. This expedition is to be conducted upon a more elaborate scale than any that have preceded it. Among those who have agreed to participate are: Mayor Rolph, Bishop Nichols, Luther Burbank and President Wheeler of the University of California. The train de luxe which has been ordered for the occasion will leave San Francisco August 22, and the trip will occupy ten days in all. Reservations are being made, and it has been decided to limit the number in the party to one hundred. It promises to be a most delightful outing for all concerned. The heartiest welcome will be accorded the boosters everywhere, and after a pleasant sojourn of three days in Victoria, there are to be stops, with attendant ceremonies of entertainment, at Seattle, Tacoma and Portland. The "Flying Legion" is a most energetic organization of disinterested citizens, who are all pledged to abandon their various avocations at the call of Commanding General Fred Koster at a moment's notice and at their own expense.

Flag Pole donated to the Exposition by the City of Astoria

SAN FRANCISCO

THE BEST LIGHTED CITY IN THE WORLD

"Pacific Service" Supplies 9,500,000 Candle Power

Failure to properly advertise its own advantages may lead to an impression in the minds of some that San Francisco does not compare as favorably as she might with other up-to-date cities in the matter of illumination. The facts and figures are of record and go to show that the Queen City of the Pacific is holding her own, from an illumination standpoint, before the world.

600 Miles of Streets lighted by 3401 Arc Lamps, 7795 Gas Lamps 261 Electroliers

Market Street is the finest lighted street in the world, as any visitor alighting at the ferries can see for himself. Starting at the Ferry Building, which is beautifully lighted, all along Market Street to Valencia and along Valencia from Market to 29th, as also on Sutter Street from Sansome to Van Ness, all thoroughfares are illuminated by large ornamental poles. Fillmore Street has ornamental arches for 14 blocks—a fine lighting system. A new system has been recently installed in the Park Panhandle. There are ornamental posts everywhere and not a complaint about the street lighting has been heard from any section of the City.

Pacific Gas and Electric Company

445 Sutter Street, San Francisco

View of the country surrounding Lake Spaulding, near the summit of the S

View of the Forebay Reservoir, at the summit of the ridge, 4,625 feet a

See story, pages 79—96, on Lake Sp

re will be some changes in the landscape when the new dam is built

d of Bear River, where the Drum Power House will be located

River Development.

How "Pacific Service" Took Part in the Fourth of July Celebration at Woodland

By E. A. WEYMOUTH, Commercial Department.

E. A. Weymouth

The Fourth of July at Woodland this year was a day of great rejoicing for the people of that inland city. Combined with the celebration of our Nation's Birthday, the advent of the first electric train over the new Sacramento and Woodland Railroad was heralded abroad and was received midst the blare of brass bands and excitement of a jubilant, jostling, carnivalistic crowd of people.

Although regular scheduled service did not begin until July 15th, excursion trains were placed in operation for this special occasion. The first trainload consisting of seven cars, all crowded to the utmost capacity and pulled by a powerful electric locomotive, arrived at Woodland from Sacramento in the morning about 9 o'clock. Excitement was rampant and enthusiasm expressed itself in many novel ways. "HANDS ACROSS THE TULES," fittingly proclaimed the sentiment from a banner heading the procession. Now and then could be seen a railroad official edgeing his way through the crowd, his face depicting the mental strain of the occasion, as well as pleasure at the satisfactory culmination of a long struggle and a work well done, responsibility well-shouldered and relief well earned.

The town was arrayed in holiday attire and the usual festivities were programmed, such as the parade, barbecue, baseball, fireworks, dance and many other attractions. One feature not on the official program but which received an enthusiastic welcome from the people, was the Pacific Gas and Electric Company's "Electrical Demonstration Car." The evening before the Fourth the car was taken to Woodland and was the first coach

Sacramento and Woodland Railroad Company's Depot at Woodland

Our Electrical Demonstration Car Joins in Celebration of the Fourth

to be hauled over the new road. It was placed on a siding just in back of the depot which is in the center of town and there opened for inspection. A very busy day was spent entertaining a large number of interested people, who strongly expressed themselves as having found pleasure and profit therefrom. The day was hot, the thermometer registering 105 degrees in the shade, but electricity through the medium of the many electric fans kept us all cool in the car. Strikingly evident and appropriate on such a day was the little ice machine in the car making ice while you waited and defying old Sol in keeping the pipes snow-white with frost.

The opportunities for entertainment about town were many during the entire day, yet it is safe to say that we led the list in attractions, for the attendance was conservatively estimated at over one thousand persons.

The next appearance of the "Demonstration Car" will be at the State Fair in Sacramento from September 14th to 21st, arrangements having been made to place our exhibit in a prominent position within the Fair Grounds adjoining Machinery Hall.

Coming

Going

Pacific Gas and Electric Magazine

PUBLISHED IN THE INTEREST OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON - - - - Editor-in-Chief
FREDERICK S. MYRTLE - - Managing Editor
A. F. HOCKENBEAMER - - Business Manager

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

Vol. IV AUGUST, 1912 No. 3

EDITORIAL

The Press of San Francisco directs attention to the fact that upwards of four years ago the electors of the western metropolis voted bonds in the sum of $1,000,000 for the construction of a municipal garbage disposal system, and that the city still awaits the completion of this project. Says the Call:

"Today the evidences of this system are a graded lot on the Islais Creek site, $132,066 paid out in interest on the bonds, the announcement that the two plants will have only a total capacity of 240 tons daily—less than half of the city's garbage accumulation—and the promise that one of the two plants will probably be ready for service some time before the end of the year, or some time next year. Sites have been purchased at North Beach and Islais Creek and the quasi-purchase of the Sanitary Reduction Works has been effected. So far $498,058.15 has been paid out.

"The only actual construction work done is the grading of the Islais Creek site. Contracts were let for the Islais Creek building in May, and Assistant Engineer T. W. Ransom says that the Islais Creek plant will be ready in about seven months. This plant will have a capacity of about 120 tons daily, less than one-fourth of the city's need. The plans for the North Beach plant are not yet finished, and Ransom says that they want to test the Islais Creek plant before going ahead with the others. It appears that it will be several years before the city will get its garbage disposal system anywhere near adequate enough for practical use.

"The plans so far show that the cost will be double the estimate, and that the city will get a system of 240 tons capacity instead of 700 tons capacity, and that another bond election will be necessary to bring the system up to the capacity required for the city. According to Ransom, $550,000 more is needed.

"The estimated cost was $755.55 per ton capacity. The building cost will be $1,491.68 per ton capacity. This is the highest price ever paid for an incinerator, but the engineers promise it will be the best in the world. The only thing in the project which has been progressing regularly—and with painful regularity at that—is the payment by the city of the annual interest of 5 per cent. on the $848,000 of the bonds sold."

Supervisor Henry Payot, Assistant City Engineer T. W. Ransom, and Fomer Assistant City Engineer H. D. H. Connick, now Chief of Construction of the Panama Pacific Exposition, are quoted on the subject, Mr. Payot attributing the delay to criminal negligence, Mr. Ransom to red tape and Mr. Connick to tardiness in furnishing machinery plans.

This case is one of many which have been called to the public notice since the municipal ownership craze started. It is not calculated to encourage further efforts in this direction, though the professional agitators keep insisting that no up-to-date municipality can be considered free and enlightened until it is invested with the ownership as well the control of its own public utilities.

The Santa Rosa *Democrat*, in a recent issue, in advertising the fact that an opposition company had completed its installation of a rival street-lighting system in the City of Roses, had this to say:

"The new street lights have been turned on and we can see about twice the number of poles in town that there should be. The city ought to have its own distributing system and charge a rental for its use. That is what the thing will come to, some day. Too many poles litter up the town and give the streets an untidy appearance."

It is of record that this newspaper went to a great deal of trouble to stir up the citizens of Santa Rosa upon the subject of competition in street-lighting. Now that the desire of its heart has been gratified it is carping at the result and is preaching municipal ownership. "Constancy, thou art a jewel."

The Union Iron Works in San Francisco, after having run its own electric power-generating plant a number of years, has given up this experiment in private ownership and has signed up with "Pacific Service" for a term of years. This is a very large and substantial contract, one of the largest private contracts entered into this year. It is of special significance as adding to the steadily growing accumulation of proof that it is better as well as cheaper to buy power than to manufacture it.

The municipality of San Francisco reached a similar decision a few weeks ago, when it entered into a contract with the Pacific Gas and Electric Company to supply power for its municipally owned and operated Geary Street Railroad.

Mr. William Randolph Hearst, while prosecuting a vigorous crusade against what he terms the unlawful trusts, is openly in favor of combination in business enterprise. Hear what he has to say in "The World To-day":

"The advantages of combination are the advantages of co-operation and superior organization. These advantages find expression in economy of production and simplicity of operation, in compact and capable organization and in the elimination of the enormous and unnecessary expense and waste and wear and tear of competition.

"Competition compels large expense in unproductive effort, and as every expense enters into the cost of production, competition compels wasted effort and results in a higher cost of production for every article.

"Competition means the division of business into smaller units, and the smaller the business the larger must be the percentage of profit to make it successful.

"Competition is merely an expression of superior business intelligence, of a faculty for better and higher organization; it is a phase of progress, a stage of development, a form of enlightenment, a result of experience and knowledge and of capacity for large affairs.

"Combination and co-operation are as essential to progress and cheap production as labor-saving machinery is.

"Greater combination, greater co-operation and better organization will never cease until business ceases to progress and develop, and an attempt to stop the progress of combination, co-operation and organization is truly an attempt to stop the natural progress and development of business."

Coming from one whose newspapers have always taken a position inimical to what the professional reformers call "the interests", this expression of opinion demands more than passing attention. As a matter of fact, Mr. Hearst is standing for what the majority of deep-thinking men of enterprise and students of political economy have claimed and are claiming every day, namely, that when Adam Smith made his oft-repeated utterance, "Competition is the life of trade," he dealt with a very different situation than obtains today. As the situation stands now, competition comes very nearly being the death rather than the life of trade.

ITEMS OF GENERAL INTEREST

IN connection with the Twentieth Annual Convention of the Pacific Coast Gas Association to be held in San Diego, September 17th to 19th inclusive, Secretary John A. Britton is sending out an appeal for new members. In this he states:

"Our present membership is 380, and with a little concentrated effort on the part of each individual member, there is no reason why this should not be increased to 500. You can never foretell what can be accomplished until an effort is made in one general direction; and when we make the statement that it is the earnest desire of all members to see our association grow and prosper, we know beyond a peradventure of a doubt that we are signing the sentiments of our members as a whole.

"It is predicted that our Twentieth Annual Convention will surpass all previous meetings of the Association. The papers which are being prepared for presentation will have to do with matters that are of the utmost importance to the gas fraternity at large. Our slogan for this campaign will be 'Do it now'."

Application blanks are enclosed with the communication, and each member of the association is asked to constitute himself a committee of one to have such application blank filled out by some one of his friends or associates interested in the gas industry.

Mr. John F.Gilchrist, Assistant to President Insull of the Commonwealth Edison Company of Chicago, passed some days in San Francisco and North Central California on his way home from the National Electric Light Association Convention in Seattle. The following communication to Mr. Britton, written upon Mr. Gilchrist's return home, shows how deeply impressed he was with what he saw of "Pacific Service":

"Dear Mr. Britton:

"As I wired you, I reached home safely after a most interesting two-weeks' trip. I was very greatly impressed with your territory, particularly the outlying territory, which is so different from what I have been accustomed to. I think the Pacific Gas and Electric Company is to be congratulated on the standard of heads of departments in its employ. I have not met any electric lighting organization which impressed me better. The possibilities of development in your country seem very wonderful to me, and you have certainly made great headway in that development. I wish to thank you again for all the courtesies which were shown me by you and your organization while I was your guest. I hope that I may be able some time to reciprocate. Very truly yours,

(Signed) JOHN F. GILCHRIST."

Under the head of "When the West Awoke a Chicago Engineer", a good story is told of Mr. Insull in a San Francisco paper. It follows:

"Samuel Insull, who has corralled most everything in the way of electrical power in and around Chicago, learned something new about the California style of producing electricity when here a few days ago. He was shown around the city by officials of a corporation in which Insull is now a director in consequence of a little matter of 40,000 shares of stock he acquired. One of the offices visited was that of a very prosperous power company. There Insull was shown a blue print map of four of the corporation's power plants. They are all on one river, and the remarkable thing about it is that each plant uses the same water. It is sent through power house No. 1, diverted around a ridge, dropped down through power house No. 2, and so forth. Insull regarded the quartet of stations for a long time, inquiring in detail into the way the water was used four times. At last he sat back and sighed, wagging his head, much impressed.

" 'Great guns!' he said. 'If I could only burn my coal four times back there in Chicago, I'd own all the electric power plants east of the Missouri river!' "

Shortly after midnight, July 5th, a fire broke out in a frame dwelling in Oakland occupied as a rooming house with stores underneath. The flames raged fiercely for a while, necessitating all electric wires to be cut in order to permit the firemen to work about the building. After the fire subsided the proprietor of one of the stores arrived on the scene. He found his place in darkness and drenched with water, and burnt wood lying all around, but when he reached up to pull the chains to the gas arcs they lighted up as though untouched by the water pouring down all around.

"Gas, as usual, seems to be the only stand-by," declared Manager Frank Leach, of the Oakland District.

In noticing the big contract recently executed between the Union Iron Works and "Pacific Service", Manager Tynan has this to say:

"The many improvements recently made at the Iron Works have severely overtaxed their steam plant, and before modernizing the power house a careful investigation by the officials of the company showed that cheaper and more reliable service could be obtained from the Pacific Gas and Electric Company's 50,000-horsepower station, which is only two blocks away, than from any private steam plant which could be built. Reliability of service is of prime importance in the ship repair business, owing to the danger to workmen in case the lighting fails, especially in the tanks of fuel oil carriers, and also on account of the heavy financial loss incurred through even a few minutes of idleness of several thousand men. Other advantages of purchased power are the ability to operate night shifts on repair work without the expense of running a steam plant for a few machines, and also the limitations of an inadequate private plant."

The San Francisco papers recently published an advertisement inserted by the Publicity Department, the burden of which was: "If you have troubles with your gas or electric service, tell them to us and not to your neighbors."

Following this, a lady customer of "Pacific Service" telephoned in to the office one day that she had trouble with her gas stove and would like to have it attended to immediately. She was evidently in a great state of perturbation and a man was sent out to look into the matter. It transpired that the customer had allowed the gas to flow from the oven burners for some time, in order, as she said, "to let the air out of the pipes." The result was the filling of the oven with gas, which when the burners were ignited immediately ignited also, and mixing with the air which was in the oven, exploded and blew out the oven door, scaring the owner almost to death. The company's employee explained carefully how ovens and other burners in general should be lighted. The incident presented a humorous side to the gas man, but it might have had serious consequences. Motto: Read our advertisements carefully and accept our offer to give free expert advice to all customers.

Announcement is made that the annual baseball game between the heads of departments will take place on the afternoon of Saturday, August 17.

Mr. John Fahrenkron, Chief Operator at Sebastopol, can do more than operate a substation. He can carry off first prizes for poultry exhibitions as well as make a financial success of the poultry business. Up there they say he even sets traps for his hens to see if each is doing her full share of egg producing. The story up there is also that he sets traps for new operators to make sure they will be all right in case of emergency.

Mr. Alex. O'Brien is Chief Operator for the Vallejo Electric Light and Power Company, but when he saw one of the Pacific Gas and Electric poles being interfered with by some grading work it did not take him long to get the North Tower Power Division office on the telephone.

A deal of new construction work has been authorized for the Stockton Water District to be done in six months from date. This includes one 14-inch well a thousand feet deep on new property on the south side of town; one 16-inch well at Pumping Station No. 2, 400 feet deep; new mains through McCloud's Addition on the north side, 10,000 feet in extent, and about the same extent of new mains on the south side in Homestead Addition. The pumping capacity of the system is to be increased by the addition of new pumps at Pumping Station No. 1 of from 10,000,000 to 12,000,000 gallons daily capacity.

The Third Annual Convention of the California State Association of Electrical Contractors was attended by Manager George C. Holberton, of the San Francisco District, who delivered an address illustrated by one hundred and fifty lantern slides, showing every phase of electric power development by "Pacific Service." To quote a San Jose paper:

"These pictures ranged from water power sites in the Sierras to power stations in San Jose and other cities, and showed in a complete manner the immense distributing system necessary to an electric power company."

Manager M. G. Hall, of the Santa Rosa District, is justly proud of the very handsome window display in his district office, for which he gives credit to Mr. W. H. Brown, of the Napa District. It represents the Sacramento Valley and San Francisco Bay, with the snow-clad Sierras in the distance. Diminutive pole lines are run from tiny little power houses in the foothills of the Sierras to the great valley of Sacramento, down the valley and through the foothills to the Santa Rosa Valley, where the town of Santa Rosa appears lit up with diminutive lights. It shows also steam power stations at Oakland and San Francisco, the bay and river filled with real water and a ferryboat plying between the two large cities. Power houses and street lights are lit up at night and give a very pleasing effect.

Manager C. W. McKillip, of the Sacramento District, has put Captain George B. Baldwin, an old and energetic employee of the company, in charge of the New Business and Appliance Department.

Second Vice-President and Treasurer A. F. Hockenbeamer has just returned from a three weeks' sojourn in Yellowstone Park. He took his family with him and enjoyed a much-needed rest. When he wasn't resting he was fishing, which is about the next thing in point of inactivity as practised by the average amateur.

On July 29, 1912, Edwin A. Rogers, of the O. and M. Steam Department, was married to Miss Anna Kennicott at Kenharbor Ranch, Westcliffe, Colorado, the home of the bride. After spending two weeks in the mountains of Colorado and in Denver, Mr. Rogers and his wife returned to San Francisco, where they will make their home. A beautiful silver carving set was the gift of the Steam Department.

What the Press Has to Say

Truly a Colossal Project

Company to Erect Dam of 30,000,000,000 gallons and Electric Power Plant of 100,000 horse-power capacity

Having secured the necessary permission from the State Railroad Commissioners, the Pacific Gas and Electric Company has started to expend a very large sum of money, in the neighborhood of $5,000,000, for the purpose of improving and extending its hydro-electric power system, which supplies electricity to the inhabitants of not less than thirty counties in the State of California.

To the nine hydro-electric plants already in active operation, three additional ones are to be constructed on the Bear River in Placer County. The location of one of these has already been fixed at a point about five or six miles north of Towle, on the line of the Southern Pacific over the Sierra. There the first installation will be made of about 53,000 horsepower, an installation second to none in the State of California at the present time.

ADDITIONAL POWER PLANTS.

Following this, there will be constructed one, or perhaps two, additional power plants further down stream, so that when the entire work is completed the Pacific Gas and Electric Company will have increased its hydroelectric power service by upward of 100,000 horsepower.

In addition to this there is to be constructed at Lake Spaulding, on the South Yuba River, a little over ten miles to the west of the first power station, a large concrete dam, 300 feet in height, which is to impound the waters of the river for storage purposes to the amount of 94,000 acre feet, which being interpreted into everyday English, means a trifle over four billions of cubic feet, or thirty billions of gallons. Some idea of the amount of this storage water may be gathered from the fact that it represents a sufficient amount to supply the City of San Francisco at her present rate of consumption for a period of three whole years.

From this dam water will be conducted to the Bear River power house by means of a large aqueduct nine miles in length and two pipe lines 6,000 feet long. From the forebay, whence the water will be discharged through the penstocks into the power station, there will be a drop of 1,350 feet.

LONG-DISTANCE LINES.

From each power house the electrical energy will be conveyed by long-distance transmission lines nearly 115 miles to the company's sub-station at Cordelia, in Marin County, and thence to San Rafael, and through this long-distance transmission power will be supplied to all sub-stations along the line and to the cities around the bay.

This is an enormous undertaking and one in which the Pacific Gas and Electric Company is making provision for the future. The work has been in contemplation for some time and was made possible some six months ago, when the purchase of $20,000,000 Pacific Gas and Electric bonds by the New York financial house of J. Pierpont Morgan supplied the necessary funds for the purpose.

WORK ALREADY BEGUN.

Plans and specifications were prepared, but in view of the operation of the public utilities act, it was not possible to commence active work until the company had secured the necessary permission from the Railroad Commission. This permission was secured but ten days ago, and already 800 men are at work, divided into five camps, scattered along the line of activities from the site of the power house to that of the storage reservoir. About a thousand men will be needed to carry on the work and some 500 head of stock. The Spaulding dam will be one of the highest in the world, and will require at least two years of active work to build. The rights of way for the transmission line have already been secured, so that all obstacles to progress have been cleared out of the way.

BRITTON EXPLAINS PLANS.

In discussing this great piece of engineering John A. Britton, Vice-President and General Manager of the Pacific Gas and Electric Company, makes this statement:

"It is a great pleasure to me to be able to announce through the columns of the press that this extension of our hydro-electric system, so long contemplated, is now in the way to become an accomplished fact. Supplying electricity to its consumers over a territory which reaches from the northerly line of Yuba County to San Jose, in Santa Clara County, the Pacific Gas and Electric Company's system at the present time has an aggregate capacity of about 190,000 horsepower, almost equally divided between that generated through its various hydro-electric plants in the mountains and that which can be supplied at a moment's notice from its steam stations in the cities of San Francisco, Oakland, Sacramento and San Jose. But the demand for electricity is growing so rapidly that we have not been able to meet the demands upon us without having recourse to other companies engaged in the light and power business.

TO CEASE BUYING POWER.

At the present time, in addition to what we supply from our own resources, we are purchasing power from three other companies to the amount of approximately 35,000 horsepower. In the near future, however, through the extensions which we have started upon, we expect to amply provide for our own requirements. In the course of two or three years we will be able to place at the disposal of our consumers of electricity upward of 100,000 additional horsepower, and when this threatens to prove insufficient, why, we will go ahead and do some more constructing.

"We are looking ahead. We realize what the year 1915 promises for the State of California. We cannot afford to be behind in the race. We hope and expect that the exposition year will find us ready for all calls upon us that may be made."

San Francisco (Cal.) Chronicle, July 14, 1912.

New Plant for Woodland

"Pacific Service" Enterprise Hailed With Delight by Citizens of Rapidly Growing Town

The Pacific Gas and Electric Company is making a move in this city that will not only be advantageous to the corporation, but will be hailed with pleasure by its patrons. For a long time it has been conceded that the company made a mistake in locating its plant on Main Street. There is not sufficient room to develop the plant to the capacity required, and property in the vicinity is not considered desirable either for residence or business purposes.

Without giving the matter any publicity, the company decided to remove the plant outside the city limits. It acquired three and a half acres facing the Sacramento and Woodland Railroad line, and between the old Pinto Gardens and the Wilson property, north of the Main Street road.

Work was commenced on the 19th inst., and rapid progress has already been made. J. A. Barker is in charge of the construction work; D. W. Rathman is the electrical engineer; E. H. Steele of the operating and maintenance department, and J. W. Coon, superintendent of the Solano power division, extending from Knights Landing to Cement, are also giving the benefit of their experience.

A temporary plant, made up of equipment that has been used elsewhere, has already been installed, under the foremanship of George M. Hollidge, and is ready to furnish power for the Sacramento and Woodland Railroad Company until such time as the permanent plant is completed. This plant has 450 horsepower. It will be supplemented by a portable plant at Elkhorn, the motor generator set of which will belong to the Northern Electric and the transformer equipment to the Pacific Gas and Electric Company.

The permanent plant will have an entirely new equipment. This equipment will consist of one bank of 750 K. W. 60 to 11 K. V. transformers, one bank of 4-250 K. W. 60-23 K. V. transformers, one 400 K. W. motor generator and switchboard, and switches for two 1100 V feeders and three 2300 V feeders.

The main building is to be of reinforced concrete, one story in height, and 36 x 64.6 feet. An ornamental feature will be a decorated iron ballustrade on the top of the building with an electric light every five feet. The estimated cost of the plant will be $51,382. About six months will be required to complete the new plant and remove the temporary one. As soon as it is ready for operation the present plant on Main Street will be taken out and the building vacated.

As soon as this improvement is completed the compny will begin the construction of a new gas plant on the same lot but north of the electric plant, and eventually both the gas and the electric plants will be located outside the city limits.

Woodland (*Cal.*) *Democrat*, June 26, 1912.

Announces New Rates

Elsewhere in this paper the Pacific Gas and Electric Company announces a new schedule of rates for lighting, effective this month. The rates are on a sliding scale and residences begins at 8 cents per kilowatt hour and down to 5 cents, according to the amount used. To those who use much light this makes quite a reduction in their bills.

Yuba City (*Cal.*) *Farmer*, June 28, 1912.

The Sacramento River Station

The auxiliary electric plant of the Pacific Gas and Electric Company, which is being built on the water front a few hundred yards north of the city limits to supply Sacramento with power, should the transmission wires from the hydraulic plant become disabled at any time, is nearing completion.

When the building is completed and the machinery it is to cover is in place the plant will represent an outlay of $744,000. It will therefore be one of the most costly manufacturing plants about Sacramento.

The concrete work for the building is practically finished, the two monster smokestacks are in place, and now some of the machinery is being installed. This means that it will not be many months before the big steam turbines are grinding out electricity. When the plant is operating Sacramento will enjoy the best electrical service obtainable outside of Oakland and San Francisco.

BUILDING COST $100,000.

The building itself is costing the company about $100,000. It was designed by Willis Polk, of San Francisco. Its ground dimensions are 68 x 103 feet, and its runs to a height of about three stories. The concrete was placed over a steel frame, and the structure has concrete walls and roof. The foundation, because of the heavy machinery to be supported, was made of piles and concrete.

The building is divided into a one-story boiler room, 92 x 73 feet in size, a two-story turbine room and a three-story electrical department.

The two turbine engines to be installed in the building will represent an outlay of $210,000; the boilers, $160,000; the condenser, $63,000; and the electrical equipment, $105,000. Some of the other items are as follows: Fuel oil tank, $22,000; tower line, $10,000; new distributing apparatus, $44,000; spur track, $22,000.

Sacramento (*Cal.*) *Bee*, July 27, 1912.

Club House for Employees

Corporation Will Equip Club House for Its Employees

There is a rocky hill in the Sierras near the South Yuba which shortly will become an island, and on this island the Pacific Gas and Electric Company will erect a clubhouse for the vacation uses of its employees. The clubhouse project is a pet idea of John A. Britton, Vice-President and General Manager of the corporation, and Britton also conceived the idea of placing the clubhouse on the island to be.

When the company finishes building its 300-foot dam at the outlet to Lake Spaulding—a work that was begun a short time ago—the lake will be increased from two miles to nine miles in length, and will become 300 feet deep. Thirty billion gallons of water, or enough to supply San Francisco for three years, will be impounded by this dam, and three power houses to generate 100,000 horsepower of electric energy will be kept running night and day by the impounded water, so that the lights of houses in San Fancisco, Sacramento and in the homes of thirty counties in all may be kept burning steadily.

But the chief point of interest to employees of the Pacific Gas and Electric Company is this, that the 30,000,000,000 gallons of water will back up around a certain hill, and that on this hill Britton will build the famous log clubhouse that has been the dream of employees since talk of it started.

It is to be furnished with numerous bedrooms, a wide porch, ample dining room and a large living room, where six-foot logs will burn while the men on vacation tell of the fish they caught and the deer they came near shooting. The lodge will cover the entire island, and from it will run a wharf—merely an extension of the porch—to which many impatient boats will be tethered.

And the lodge will be lighted by electric lights! *San Francisco* (*Cal.*) *Call*, July 27, 1912.

Stock Soaring Skyward

Heavy buying of Pacific Gas and Electric common in the East yesterday forced the price there from Tuesday's figure of $61.25 to the high level of $66 bid. A sale was made here at $65.37 1-2, seller, 90 days.

It was stated yesterday that interests in the East already owning stock had decided to increase their holdings, the sudden buying campaign resulting from word from this city that this was the time to load up. Large orders for the stock came from Chicago, and this fact was taken connect Insull, among others with the buying, together with the declaration made privately by the Chicago power magnate, when here recently, that he regarded the block of Pacific Gas and Electric stock he and his associates acquired as the best buy he had made for years.

The stock's performance was the talk of the street, and many rumors of power company amalgamation were revived. To all appearances these were but conjectures.

When the local exchange opened this morning the stock was $64 bid in New York. It is said that the buying will continue today, as there are still many orders in.

San Francisco (*Cal.*) *Call*, July 18, 1912.

New Lights for Park' Panhandle

The Supervisors have granted permission to the Pacific Gas and Electric Company to remove ten arc lights from the Park Panhandle and install twenty-one new lights in their places. The new lights have been given a successful test at Sacramento and if the test to be given here proves satisfactory it is not unlikely that the system will be adopted for all park lighting. The company will bear the expense of removal and installation and in addition guarantees that the cost of the twenty-one new lights will not exceed the cost of maintaining the arc lights to be removed.

San Francisco (*Cal.*) *Municipal Record*, July 4, 1912.

PACIFIC GAS AND ELECTRIC COMPANY

DIRECTORS

F. B. Anderson
Henry E. Bothin
John A. Britton
W. H. Crocker
E. J. De Sabla, Jr.
F. G. Drum
John S. Drum
D. H. Foote
Wm. G. Henshaw
A. F. Hockenbeamer
Samuel Insull
John Martin
C. O. G. Miller
Louis Sloss
George K. Weeks

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John A. Britton	Vice-Pres. and Gen. Mgr.
A. F. Hockenbeamer	2d Vice-Pres., Treas. and Comp.
J. C. Love	Asst. Treasurer
J. H. Wise	Asst. General Manager
D. H. Foote	Secretary and Asst. Treasurer
Charles L. Barrett	Asst. Secretary
W. R. Eckart	Consulting Engineer
F. G. Baum	Consulting Engineer

HEADS OF DEPARTMENTS

M. H. Bridges	Auditor
W. H. Kline	General Agent
R. J. Cantrell	Property Agent
George C. Robb	Supt. of Supplies
J. H. Hunt	Purchasing Agent
E. B. Henley	Manager Land Dept.
J. P. Coghlan	Manager Claims Dept.
H. Bostwick	Secretary to President
F. S. Myrtle	Manager Publicity Dept.
L. H. Newbert	Manager Appliance Dept.
G. C. Holberton	Chief Engineer Stockton Water Dist.
W. B. Bosley	Attorney
H. C. Vensano	Civil Engineer
E. C. Jones	Engr. Gas Dept.
H. P. Pitts	Industrial Engineer
S. V. Walton	Manager Commercial Dept.
S. J. Lisberger	Engr. Electric Distribution
Sherwood Grover	Asst. Engr. Gas Department
J. P. Jollyman	Engr. of Electric Construction
P. M. Downing	Engr. O. & M. Hyd.-Elec. Sect.
C. J. Wilson	Asst. Engr. Electric Distribution
F. H. Varney	Engr. O. & M. Steam & Gas Eng. Sect.

DISTRICT MANAGERS

District	Headquarters	Manager
Alameda Co.	Oakland	F. A. Leach, Jr.
Antioch	Antioch	F. J. Southerland
Berkeley	Berkeley	F. A. Leach, Jr.
Chico	Chico	H. B. Heryford
Colusa	Colusa	L. H. Hartsock
Contra Costa	Martinez	Don C. Ray
Fresno	Fresno	W. M. Henderson
Grass Valley	Grass Valley	John Werry
Marysville	Marysville	J. E. Poingdestre
Marin	San Rafael	W. H. Foster
Napa	Napa	O. E. Clark
Nevada City	Nevada City	John Werry
Oakland	Oakland	F. A. Leach, Jr.
Petaluma	Petaluma	H. Weber
Placer	East Auburn	H. M. Cooper
Redwood	Redwood City	E. W. Florence
Sacramento	Sacramento	C. W. McKillip
San Francisco	San Francisco	G. C. Holberton
So. San Francisco	So. San Francisco	Frank P. Edwards
San Jose	San Jose	J. D. Kuster
Santa Rosa	Santa Rosa	M. G. Hall
Solano	Dixon	C. E. Sedgwick
Stanislaus	Newman	W. A. Widenmann
Vallejo	Vallejo	A. J. Stephens
Woodland	Woodland	W. E. Osborn

MANAGERS OF WATER DISTRICTS

Colfax (Alta)	Jas. Martin
Nevada (Nevada City)	George Scarfe
Placer (East Auburn)	H. M. Cooper
Standard (Electra)	W. E. Eskew
Stockton (Stockton)	J. W. Hall

SUPERINTENDENTS OF POWER DIVISIONS

Colgate	Joseph Mini
De Sabla	I. B. Adams
Electra	W. E. Eskew
Marysville	C. E. Young
Nevada	George Scarfe
North Tower	C. D. Clark
Oakland	William Hughes
Sacramento	J. O. Tobey
San Jose	J. O. Hansen
South Tower	A. H. Burnett
Stockton	E. C. Monahan
Solano	J.W. Coons

SUPERINTENDENTS OF STEAM ELECTRIC STATIONS

H. N. Mosher	Chief Engr. Station "C," Oakland
C. A. Eastwood	Chief Engr. Station "A," San Francisco
T. E. Fogalsang	Supt. Generating Statn., San Francisco
J. W. Varney	Supt. of Sub-Stations, San Francisco

SUPERINTENDENTS OF ELECTRIC DISTRIBUTION

Berkeley	J. H. Pape
Oakland (Underground)	R. C. Powell
Oakland and Alameda (Overhead)	A. U. Brandt
Sacramento	C. R. Gill
San Francisco	A. R. Thompson
San Jose	A. C. Ramstad
Valley District (Chico, Marysville, Woodland and Colusa)	W. F. Beidl

SUPERINTENDENTS OF GAS WORKS

Martin Station	John Mitchell
Oakland	A. C. Beck
Sacramento	Edward S. Jones
San Francisco	Dennis J. Lucey
San Jose	R. H. Hargreaves

SUPERINTENDENTS OF GAS DISTRIBUTION

Oakland	George Kirk
San Francisco	D. E. Keppelman
Superintendent of Railway Department	N. J. Hullin

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	187	1,081,222
Gas	49	978,167
Water	10	45,825
Railway	1	60,000

	Place	Population
	Alta	20
1	Alameda	25,000
2	Albany	800
	Amador City	200
	Adams John	25
	Alleghany	200
	Alto	25
	Angel Island	280
5	Auburn	2,375
	Agua Caliente	100
	Alvarado	900
	Antioch	3,000
2	Barber	500
2	Belmont	350
	Ben Lomond	800
	Belvedere	1,000
	Benicia	3,360
2	Beresford	25
2	Berkeley	40,000
	Biggs	750
	Big Oak Flat	20
	Brentwood	200
	Broderick	200
	Brown's Valley	50
	Byron	200
2	Burlingame	4,000
	California City	25
	Camp Meeker	200
	Campbell	600
	Centerville	1,000
	Centerville	20
2	Chico	13,000
2	Colma	3,500
2	Colusa	1,500
	Concord	1,500
	Cement	1,500
5	Colfax	500
	Cordelia	150
	Corde Madero	350
	Crockett	2,500
	Crow's Landing	375
	Cupertino	50
	Daly City	250
	Danville	250
	Davis	750
	Decoto	350
	de Sabla	25
5	Dixon	1,000
	Dobbins	50
	Davenport	1,000
	Drytown	20
	Durham	500
	Dutch Flat	500
	Duncan's Mills	150
2	Easton	300
2	East San Jose	1,660
	Eagle's Nest	50
	Edenvale	500
	Eldridge	500
	Elmira	150
	El Verano	400
2	Emeryville	5,000
	Encinal	100
	Fairfax	500
	Fairfield	834
	Forestville	100
	Felton	300
1	Fresno	30,000
2	Fair Oaks	250
	Folsom	1,800
	Gilroy	2,000
	Glen Ellen	500
	Gold Run	100
3	Grass Valley	4,500
	Gridley	1,800
	Groveland	125
	Guerneville	500
	Hammonton	500
2	Hayward	4,000
2	Hillsborough	1,000
	Hollister	3,000
	Hookston	75
	Ignacio	100
	Ione	900
	Irvington	1,000
	Jackson Gate	100
	Jackson	2,035
	Kennedy Flat	20
2	Kentfield	250
	Knight's Landing	350
	Lake Francis	5
	Lathrop	300
	Live Oak	200
	Livermore	2,250
	Los Gatos	3,000
	Larkspur	600
	Lincoln	1,400
2	Lomita Park	100
	Los Altos	500
5	Loomis	400
	Martinez	5,000
	Martell	150
2	Marysville	7,000
	Mayfield	1,500
2	Menlo Park	1,500
	Meridian	300
2	Millbrae	300
	Milpitas	300
	Mill Valley	2,500
	Mission San Jose	500
	Mokelumne Hill	150
	Monte Rio	50
	Moulton's Landing	30
	Mountain View	2,500
	Mt. Eden	200
	Mare Island	500
2	Napa	7,000
3	Nevada City	2,700
	New Chicago	10
	Newark	700
5	Newcastle	750
	Newman	1,000
	Niles	800
	Nicolaus	75
	Novato	250
2	Oakland	230,000
	Oakley	80
2	Palo Alto	6,300
	Pacheco	200
	Penryn	250
	Patterson	300
	Penn Grove	300
2	Petaluma	5,500
2	Piedmont	1,720
	Pike City	200
	Pinole	1,500
	Pittsburg	2,372
	Pleasanton	2,000
	Point San Pedro	20
	Port Costa	600
2	Redwood City	3,200
2	Richmond	10,000
	Rio Vista	884
5	Rocklin	1,000
5	Roseville	2,600
	Rodeo	500
2	Ross	500
4	Sacramento	60,000
	San Andreas	200
2	San Anselmo	1,500
2	San Bruno	1,500
2	San Carlos	100
2	San Francisco	416,912
2	San Jose	30,000
2	San Leandro	4,000
	San Lorenzo	100
2	San Mateo	6,500
2	San Quentin	2,500
2	San Rafael	6,000
	San Pablo	1,000
	Santa Clara	6,000
	Santa Cruz	16,000
	Saratoga	50
2	Santa Rosa	12,000
2	Sebastopol	1,200
	Sausalito	2,500
	Smartsville	500
2	South San Francisco	2,500
2	Stanford University	2,600
	Sonoma	1,200
	Stege	1,000
5	Stockton	30,000
	Suisun	1,200
	Sutter City	150
	Sutter Creek	1,500
	Sunnyvale	1,500
	Tiburon	400
	Tormey	20
	Towle	100
	Tracy	1,200
	Vacaville	1,200
2	Vallejo	15,000
	Walnut Crek	350
	Warm Springs	200
	Watsonville	4,500
	Wheatland	1,400
	Winters	1,200
2	Woodland	3,200
	Yolo	400
2	Yuba City	1,200
	Total	1,136.222

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,500 people.

OPERATES 11 hydro-electric plants in the mountains.
4 steam-driven electric plants in big cities.
17 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,950 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

PACIFIC GAS AND ELECTRIC MAGAZINE

Published Monthly by
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO

VOL. 4 SEPTEMBER, 1912 No. 4

CAMP FOREBAY, NEAR DRUM POWER-HOUSE.

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Pacific Gas and Electric Magazine

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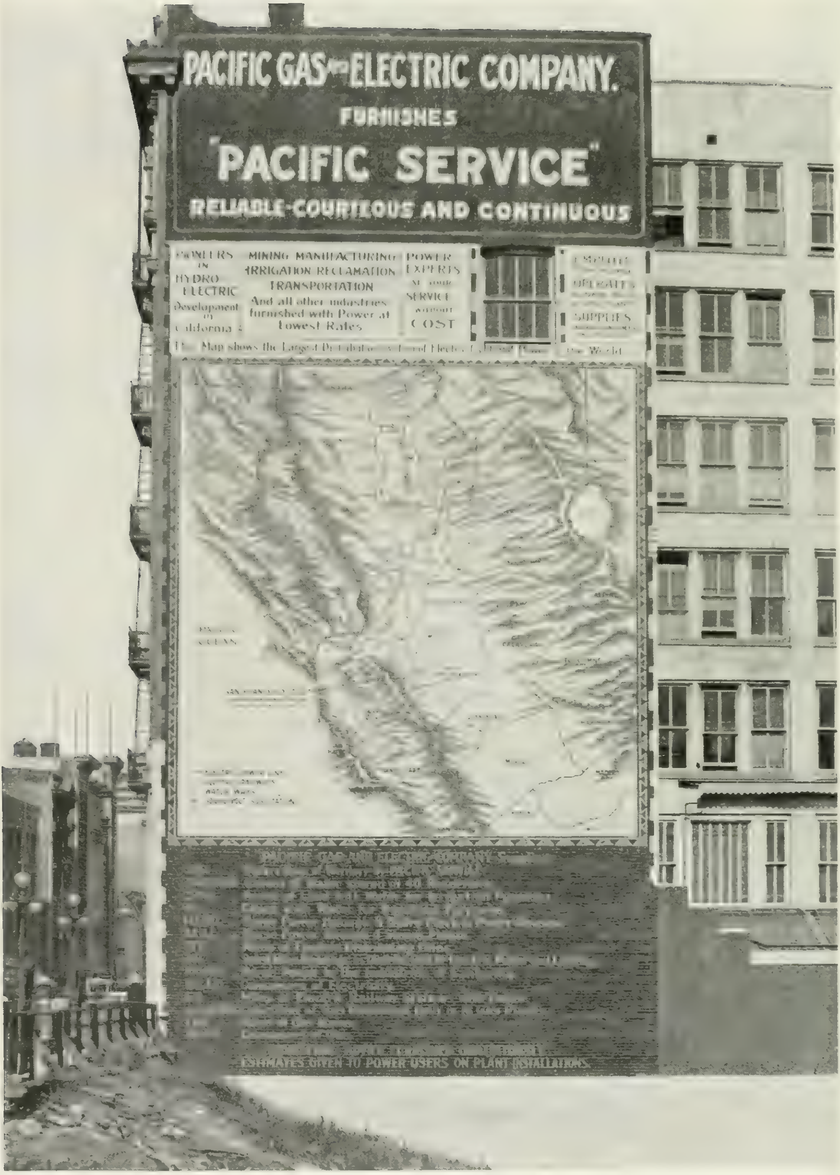
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PACIFIC GAS AND ELECTRIC MAGAZINE

VOL. IV SEPTEMBER, 1912 No. 4

Construction Methods at Lake Spaulding Dam

By R. G. CLIFFORD, Division Engineer, Spaulding Dam.

R. G. Clifford

The Pacific Gas and Electric Company's new development on the South Yuba Watershed was outlined most cleverly to the readers of this magazine in the August number, and but little could be added in the way of general engineering data and plans covering the Lake Spaulding Dam and the Drum Power System now in course of construction.

Mr. Wise has told us that there are already about twenty artificial lakes situated on the many feeders of the South Yuba River which prevent much of the winter's rain and snow from being wasted during the spring floods and allow of a steady supply to the irrigable lowlands during the dry months from May to October. He has also informed us that in the average year these lakes are capable of taking care of only one-half of the water from the one hundred and twenty square miles forming the catchment basin, and that it is now planned to save this waste water by creating a single reservoir with a capacity equal to the twenty smaller ones now existing and that the lowest of these present reservoirs, Lake Spaulding, offers the logical site for this purpose.

It is the purpose of this article to touch on the equipment required for a project of this magnitude and to outline to such readers as are interested in this development just how a great mass of 760,000 tons of cement, sand and rock can be placed in a distant mountain gorge in an economical manner and, at the same time, retain a body of water over 300 feet deep with absolute assurance of safety.

The first and greatest problem that arises on nearly every construction work is the matter of transportation. In the general layout of the proposed system this problem is more than half solved by having a splendid railway system paralleling the work from one end to the other at a distance of not exceeding four miles. When it is considered that 160,000 tons or 4,000 carloads of materials, supplies and machinery are to be used on this work it becomes clear why the first step of the construction forces has been to build a standard gauge railroad between the Southern Pacific main line and the main construction plants on either end of the work.

The type of dam to be constructed is what is known as the "Gravity Type", which depends entirely on its own weight to resist the overturning effect of the water, and, to give added stability to the structure, the dam is built with an arched plan, the convex side being, of course, upstream so that the effect of the water pressure is partially transmitted to the granite bluffs against which the two ends of the dam rest.

Gravel Bunker, Sand Deposit, and General View of Camp 1

The logical manner of placing such a great mass of concrete is to utilize gravity to the utmost, and for this reason all of the materials to be used are carried to a point just above the crest of the dam and on the side which is most precipitous, and the concrete is to flow down into the dam in troughs and distributed by means of specially designed booms carrying troughs somewhat similar to those which carry the material away from the mixers. To avoid disintegration of the concrete mixture in descending the perpendicular bluffs which lie between the mixers and the bottom of the gorge, light metal towers will be placed, down which the material will flow in zig-zag troughs until reaching the distributing hoppers.

When it is no longer possible to utilize gravity in the work of concrete distribution, belt conveyers will be employed at a small outlay of power to carry the material to distributing towers placed at intervals over the 900 feet, which is the total length of the crest.

It is interesting to note how perfectly nature has made preparations for this dam and how many of the usual problems confronting the dam builder are already solved. Most important of all are the foundations, which are absolutely flawless. The granite bluffs rising just high enough on either side have been cleaned of all loose material by the glaciers on their advance towards the sea and have also left ideal quarries, bare of any earth, ready for use in the gorge below. Even the conformation of the canon at the point chosen is such that the arched dam will fit like a plug in a watermelon with the pressure on the outside.

The glaciers have not only scraped the bedrock clean but they have brought to convenient locations, just above the dam site, two large deposits of sand and gravel which will be washed of the overlying layer of silt and then transferred to the mixers for use in the concrete.

The third important gift of nature is the three or four million feet of timber growing on the lands adjacent to the reservoir, all of which timber is rapidly being converted into lumber for buildings, bunkers and railroad ties, as well as for concrete forms to be used in the canal, tunnel and dam. Although much of the best timber has already been cut and shipped out to the Pacific Coast markets, there is ample left for construction purposes, and we have the benefit of several miles of track as well as a complete mill with a capacity of 30,000 F. B. M. per day, logging engines, railroad locomotive and cars.

Turning now to the methods employed by the construction forces in handling the materials, let us first consider the quarry which is to furnish about 150,000 tons of crushed rock and as much again of large masses termed pudding stones or plums. The quarry floor is at the same elevation as the end of the railroad track, 75 feet above the ultimate crest of the dam. Air drills supplied with air from two compressors are used in connection with the rock excavation, and the large masses of rock will be loaded by derricks onto skips which are to be picked up by cable ways spanning the canon and deposited directly in the fresh concrete as it is poured into the forms for the dam; the smaller material, however, is to be loaded in cars and carried to two large gyratory crushers. From the time the rock is dumped into the crushers until it is finally placed 1,000 feet away in the dam, the material will be handled by mechanical means and at the rate of 150 tons per hour when necessary. A belt conveyor passing under the crusher spouts will pick up the material and carry it up an incline, depositing it into a natural basin of granite, underneath which a trap, or timber tunnel, extends longitudinally with four gates in the roof. These gates will feed mechanically at any rate desired onto a belt conveyor which, in turn, passes the material over to another conveyor traveling nearly at right angles and extending lengthwise of the service bins which will keep a small supply of the concrete ingredients ready for the mixers. These mixers, which

Gravel Deposit, Trap, and Narrow-Gauge Locomotive

Men at work on Canal leading down from Tunnel

are mounted directly over the service bins, will be automatically fed by motor-operated gates, and even the titling of the mixers is performed by motor-drive.

The two deposits of sand and gravel will need different treatment to work each to the most advantage. The so-called upper deposit, situated on the same grade as the main railroad line, is fan-like in shape, and a large donkey engine placed at the handle of this fan will operate a six yard scraper such as is used by the dredger companies around Oroville to level the boulder piles. The top earth and silt together with a thick growth of trees has already been removed and the scraper is now ready to excavate all the sand needed for the rest of this season. A belt conveyor is again utilized to carry the scraped material up a steep incline to a washing plant which removes all silt and also separates the sand and gravel, dropping the material into bins from which the cars take their supply to the storage bunkers at the dam.

The so-called lower deposit is by far the larger body of material and there is more coarse gravel contained in it. Owing to the conformation of the ground here and the presence of sufficient water 250 feet above, the hydraulic method of excavation is to be employed. A 40-foot bank will be torn away with a powerful stream of water and a sluiceway will carry the sand and gravel to the second washing plant. A cable tram having three large cars hanging on either end will haul this sand and gravel up an incline 1200 feet long to bunkers situated along the main railroad line.

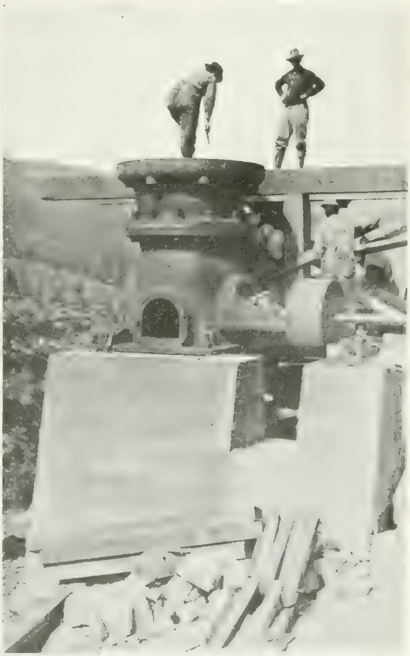
Passing now from the collection of materials for the dam proper to the lumber that is being cut, we find a very efficient logging and mill crew which is carrying on a small industry by itself. The timber that will be ultimately on flooded ground is naturally the timber to be cut first, and so three logging engines used by the defunct Birce and Smart Company were brought in from the more distant timber lands and mounted on rafts. These are towed by a launch to suitable points of attack on the edge of the lake, where they are made fast and put to work hauling the logs down into the lake where they are formed into a raft and towed to the landing skidway. Here they are yanked up one at a time and loaded onto cars to be carried to the mill pond.

Besides the new timber being cut, hundreds of old logs, left behind when John Spaulding created the present lake in 1892, have been rescued and cut up into timber, and it is hadly conceivable that a great deal of the sound timber that is now in use in the trestles and buildings comes from the logs that have been floating around like so many derelicts for twenty years. But far more remarkable is a discovery made on the day of this writing by the head sawyer. He was cutting a large sugar pine log and had removed a thick slab and two 2-inch planks, when some flying teeth from the saw caused a short stop and a quick investigation. There, sixteen feet from the butt and buried at least eight inches from the bark, were three big old style iron nails driven into the tree many years ago by some pioneers, passing along the Emigrant trail. After repairs were made to the saw and the log was further ripped up three more nails were uncovered on the other side.

It is not possible in a limited article to go very far toward describing the many details of construction equipment, and there is nothing unique about many of the methods employed. Some new methods of excavation are being employed on the canal, and Mr. Noble and Mr. Martin who are looking out for most of this construction will doubtless cover these interesting features in a future number. The first mile of the canal, however, which is on Division One, has one noteworthy feature in that it circles around through a series of springs which are the very head waters of Bear River. It practically severs the arteries that gave life to this river, and it becomes necessary to build a reinforced concrete canal with a most elaborate draining system. At fifty-foot intervals, or closer when necessary, 8-inch tile is laid with open joints under the canal and out through the lower berm; but every drop of water that can be picked up will be collected and dropped into the top of the canal.

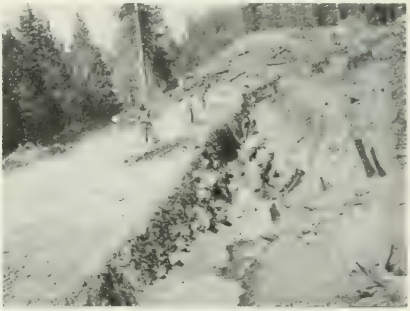
The tunnel which leads the water from the reservoir to the canal passes under a precipitous piece of country, and besides being attacked from either end it will be opened at an intermediate point so as to make four working faces. This tunnel is the only part of the construction work that can be prosecuted through the winter months owing to the great depth of snow at this altitude.

The spillways, which are really large dams in themselves, are of the same general type as the main dam except for the profile of the



Installing large gyratory crusher

Derrick lifting rock for canal



Men at work on canal

down stream face, which is designed to run the water down with the least possible wear. The spillways are placed across gaps which are lower than the crest of the main dam and in two places are 100 feet in height. The total length of the spillway is 1,400 feet and the method of construction will not be as simple as in the case of the main dam. The logging road will be utilized for hauling material to the mixing plant which will be at the foot of the largest spillway, and the concrete hoisted in a tower and distributed by gravity much as is done in the most up-to-date building construction. A very large percentage of quarried stone will be used in these spillways as there is an abundance of material at hand. Deep powder drifts with cross-cuts will be run in at convenient points adjacent to the two high portions of the spillway and the great blocks of stone obtained in this way will be placed in the concrete by powerful derricks.

It can be readily understood that a great deal of power is necessary to operate the varied equipment used in this work, and one of the first things done was to extend a substantial line at 22,000 volts from the nearest point of the Company's system at Alta. Approximately 2,000 horsepower will be required to operate all the machinery now purchased for this work.

It seems fitting here to extend a cordial invitation to all those interested in the projects being undertaken by the Pacific Gas & Electric Company or who view the work purely from an engineering standpoint to visit the scene of activity and gain first hand the many details that cannot very readily be touched on in this article.

* * *

Just Some Oddities

"Yes, he had some rare trouble with his eyes," said the celebrated oculist. "Every time he went to read he would read double."

"Poor fellow," remarked the sympathetic person. "I suppose that interfered with his holding a good position?" "Not at all. The gas company gobbled him up and gave him a lucrative job reading gas meters."

The attorney demanded to know how many secret societies the witness belonged to, whereupon the witness objected and appealed to the court. "The court sees no harm in the question," answered the judge. "You may answer." "Well, I belong to three." "What are they?" "The Knights of Pythias, the Odd Fellows, and the gas company."

"Pacific Service" Supplies the World's Largest Baths

By J. E. VAN HOOSEAR, Industrial Department.

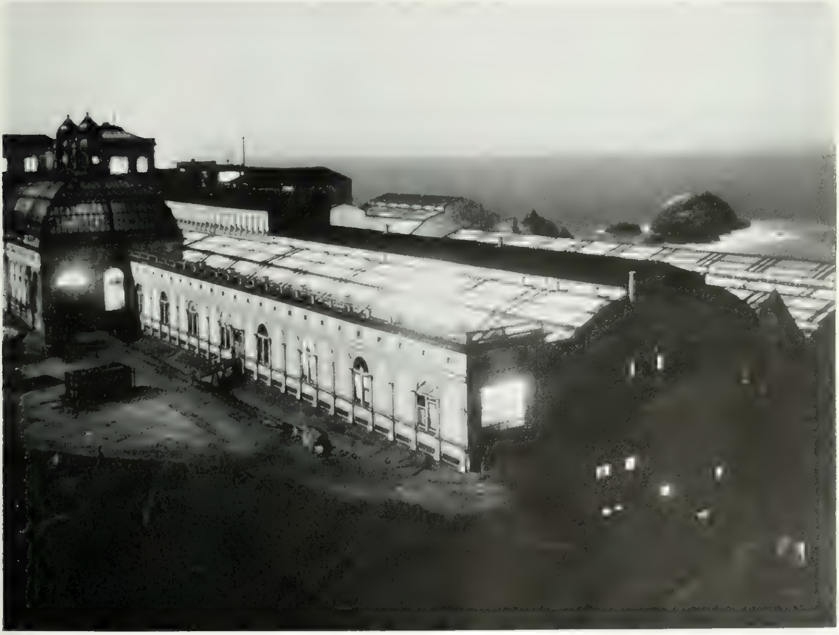
J. E Van Hoosear

A very recent piece of business secured by the Industrial Department of "Pacific Service" is the light and power load of the famous Sutro Baths in San Francisco which, from the time they were opened some seventeen years ago, have been operated independent of any outside power.

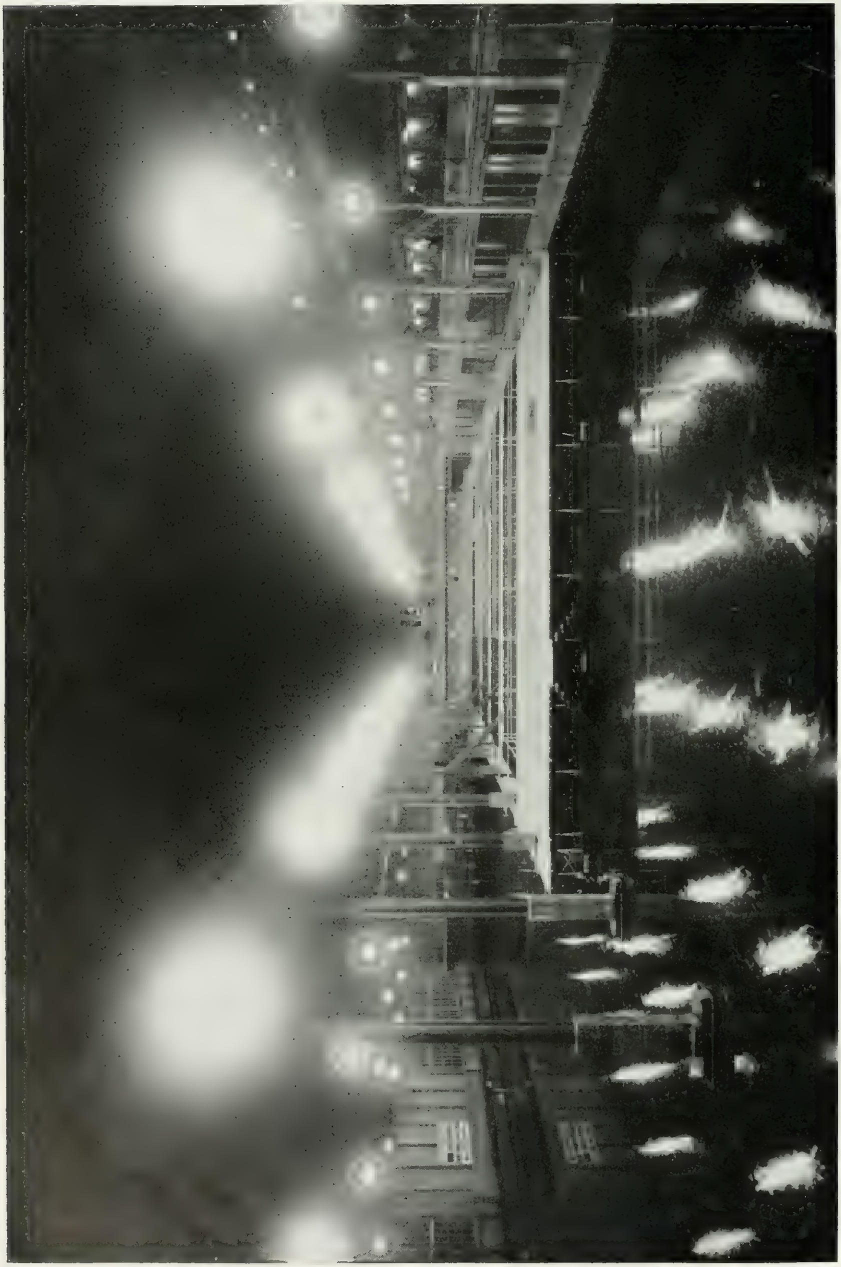
It is necessary to maintain a large boiler installation to heat the water for the tanks, which is changed every day, as well as to furnish hot water and steam for the laundry where the several hundred towels and bathing suits are cleansed. In the beginning an engine and a generator were installed to furnish light for the building and a small engine to operate the several machines needed. This was a very good combination, but it had many uneconomical as well as inconvenient features, namely, running of boiler plants when heating and laundry work were finished so as to be ready when lighting load came on, operating the whole plant when only a few lights were needed, and a great many other things too numerous to mention.

With the central station service now installed all this is changed, as it is now possible to use any number of lights from one to the whole number at any time, and also to use all sorts of electric apparatus, such as electric hair dryers, electric warming pads, sewing machines, and many other electric devices.

In making this change the entire power and



Sutro Baths, illuminated by "Pacific Service."



New Installation of "Pacific Service" at the Sutro Baths, San Francisco. The installation consists of 60 500-watt Tungsten lamps.

Where Ocean connects with the Sutro Baths

lighting installation was carefully looked over and such changes recommended as would give the consumer the most efficient and up to date system. The lighting of such a structure as this presents a problem that cannot be settled in an off-hand way, but needs the careful study of one who is familiar with illuminating problems. Not only is the building of great size, but all the walls and structure work are painted green to correspond to the color of the water, which does not reflect the light. The requirements, therefore, are much greater than if light-colored surfaces were presented.

The original lighting installation was installed some seventeen years ago and consisted of about 56 arc lamps of 110 volt 9 amperes and 750 16-candle-power carbon lamps. This, at the time of installation, was very good lighting, but it was during the early stages of electric illumination and many improvements have been made since then. This being the case it was found expedient to make many changes in the installation, which now not only gives better lighting results, but economizes in the consumption of current and in the general upkeep. These changes consisted of replacing carbon lamps with either Tungsten or Gem filament lamps, and the arc lamps were replaced with 86 500-watt clear Mazda lamps, equipped with white enameled metal shades. These large lamps light up the main bath building, and being hung at a uniform distance from the water, and in such a way as to be in long rows, from any point of observation present a beautiful and effective installation that can only be appreciated by seeing them illuminated.

Following is a brief history of the Baths and data regarding the building and its contents:

At the base of the rocks near the Cliff House, the late Mr. Adolph Sutro noticed a small inlet that was protected from the fury of the waves that sweep the beach by the several groups of seal-rocks. Being an engineer, he knew this to be an ideal place for a swimming pool, so from this beginning the present Sutro Baths were developed.

The Baths' building stands somewhat north of the Cliff House, and its entrance from Point Lobos Avenue is a small classic temple. From this the museum gallery is reached by broad stairways flanked by shrubs and flowers. Here are placed the archaelogical and other collections of Mr. Sutro, mummies and innumerable other curios from ancient Egypt, a goodly number of specimens of Aztec pottery and art, Damascus plate, beautiful fans from various countries, Chinese and Japanese swords, wooden ware used by the North American Indians and totems from Alaska; while in the gallery proper is to be found a superb collection of birds and animals, scenes from Japanese life, portfolios of photographs, valuable State papers and hundreds of other works of art and curios. From the museum gallery the visitor can reach the Baths, either by stairways or by elevator.

Striking as is the first view, familiarity only makes it more striking. Its size impresses the visitors at once, yet it is not oppressive owing to the lightness and airiness of the structure. Tier upon tier of seats rise to the galleries, while at their base are the swimming tanks. The water for these is supplied by an ingenious use of the ocean waves. A basin scooped out of solid rock receives the water that dashes over the top, thence it is conducted to a settling tank; by numerous small canals it makes its way into the various swimming tanks, of which there are six in all, the largest one containing the sea water in its natural state, the others being heated to different temperatures to suit the varying requirements of visitors. As stated, the Baths are filled by the ocean itself. Should, however, the tides be so low as to necessitate pumping, preparations have been made for this, and the water can be forced in at a rate of 6,000 gallons per minute by means of a large turbine pump placed at sea level in a cave-like excavation hollowed out of the solid cliff and heretofore driven by means of a steam-engine which is now about to be replaced with a 35 horse-power 2-phase motor which can be controlled from the switchboard room and can be operated at any time, day or night, to suit the tides without previous preparation in the way of getting up steam. The service of the supplying Company, the Pacific Gas and Electric Company, is available at any time, of course, and is therefore a most convenient form of motive power.

The mere emptying of the tanks entails no difficulty, but the emptying of them in such a manner as to prevent the once used water from again entering the tanks requires ingenuity. The refuse water in the main outlet, into which all the tanks ultimately empty, is piped hundreds of feet to the side of the headlands, thence passed into the tidal current away from the Baths.

Sight alone will give a comprehensible idea of the Sutro Baths. Some approximate idea may be reached by the following figures:

Length of baths, 499.5 feet.
Width of baths, 254.1 feet.
Amount of glass used, 100,000 superficial ft.
Iron in roof columns, 600 tons.
Lumber, 3,500,000 feet.
Concrete, 270,000 cubic feet.
Seating capacity amphitheater, 3,700.
Seating capacity promenade, 3,700.
Holding capacity, 25,000.
Salt water tanks, 6.
Capacity of tanks, 1,804,962 gallons.
Fresh water, plunge tank, 1.
Toboggan slides in baths, 7.
Swinging rings, 30.
Spring boards, 1.
Private dressing rooms, 517.
Club rooms capacity, 1,110.
Time required to fill tank by waves, 1 hour.
Time required to fill tank by pump, 5 hours.

The Baths are protected from the sea by two enormous breakwaters aggregating 700 feet in length containing 750,000 cu. ft. of rock, every part having been constructed so well that it is now in as good condition as when built.

A Millihour Stop-Pendulum

By OTTO A. KNOPP.

Otto A. Knopp

Some six years ago the writer perfected a special method for testing Watthour Meters in the laboratory, testroom or on consumer's premises, which has been adopted since by a number of lighting companies on this Coast. It was described in the May, 1910, issue of the Pacific Gas and Electric Magazine and published by Shephard and Jones in their book entitled "The Watthour Meter."

In this method of test a timing device is used to measure the time required for the disk of a meter to complete one, two, or three revolutions with an applied load in watts or one, two, or three hundred times the disk constant K. This time interval for a correct meter is supposed to be one hundredth of an hour, because

$$(100 \times K) \text{ Watts} \times \frac{1}{100} \text{ hour} = \text{K. Watthours.}$$

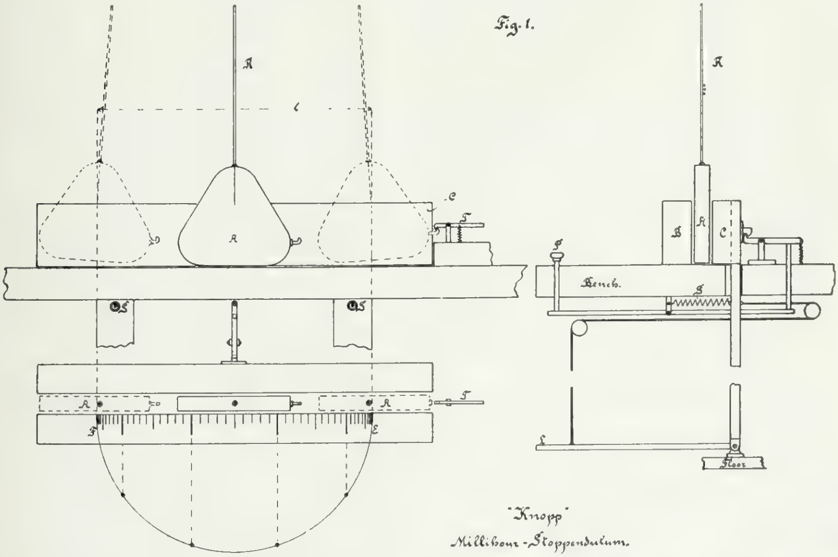


Fig. 1.

"Knopp" Millihour-Stoppendulum.

The timing device used so far in the practical application of this method has been a special stop-watch, the large hand of which makes one revolution in one hundredth of an hour; the face of the watch being divided in tenths called Millihours and tenths thereof giving a hundred division dial. It has the advantage that the accuracy of the meter under test can be read directly off the watch after timing, therefore eliminating all elaborate calculation.

It was noted after using this method for years on all classes of work, that for laboratory and standardizing work, a more accurate timing device would be desirable for higher class work than the Millihour stop-watch. This watch was sufficiently accurate for commercial testing, but for precision work was unsuitable due to time errors particularly when starting.

To meet this requirement the writer designed a Millihour Stop-pendulum (making one cycle in 1/.1000 hour, or one Millihour) which possesses all the advantages of absolute time accuracy, and has no starting errors whatever. This Stop-pendulum has proven as simple in manipulation as the stop-watch; it is used not only for laboratory precision work, but also for commercial shop testing and, further, for checking the Millihour stop-watches used for outside work.

The construction of the pendulum is given in Fig. 1. "A" is a flat triangular weight of approximately 8 or 9 pounds, hanging on a ⅛th inch steel rod "R" of over ten feet length, which rests on a double diamond jewel suspension. The weight swings between two parallell oak wood jaws, one stationary jaw "B" and one movable jaw "C." The movable jaw can be set by the foot-lever "L" in a tripping position, so as to let the weight "A" swing free between both jaws. A light pressure on the push button "P" releases the movable jaw "C," which is drawn with great force by two strong springs "S" against "B," clamping the pendulum weight "A" instantaneously in its momentary position. A scale of the length "1" between the reversing points "E" and "F" is divided in five equal time intervals representing .1 Millihour, each interval again in ten time intervals representing .01 Millihour or .00001 hour.

When testing a meter according to the above described method, the time for each measurement is one hundredth of an hour, therefore the pendulum, after being started at "E" by releasing the trip "T" should complete just 10 double swings or cycles, that is, return the tenth time to "E" when stopped in the same instant in which the meter disk makes the allotted number of revolutions. If the pendulum weight stops at one of the 1/5 time interval divisions ahead of "E," the correction factor of the meter under test would be .99, because 1/5 of the time from "E" to "F" is 1/10 of the time of one cycle or 1/100 of 10 cycles. If the pendulum weight stands at one of such divisions behind "E," the correction factor is 1.01.

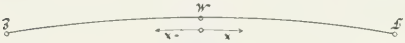
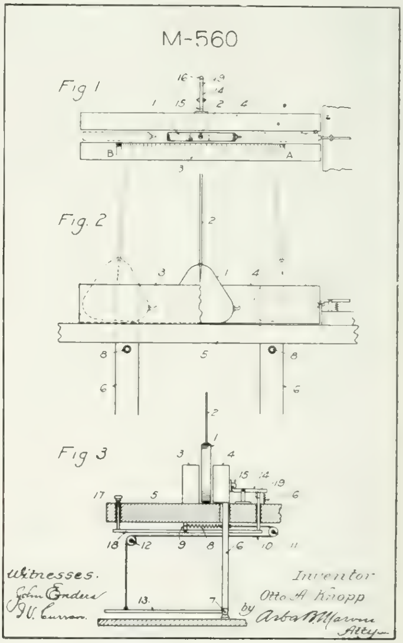


Fig. 2.



In order to divide the arc E—F into equal time intervals, theoretically correct, we use complicated formulae which require the use of elliptical functions for solution, but if we take the arc E—F as a straight line, it introduces only a negligible error for an arc below 10 degrees; the formula is simply:

$$X = C \sin\ (2\ t\pi\ t/T)$$

T=Time for one period from E to F to E

Where

t=Time pendulum spends in passing from M, Fig. 2, over the distance X.

Graphically we may divide the scale according to the formula, simply by erecting a semi-circle over E—F dividing the circumference in to as many equal parts as we wish to give divisions to the scale, in our case 50, and projecting these points down upon the line E—F. See Fig. 1.

The length "L" of the pendulum is under the assumption that its total weight is concentrated at its lowest point.

$$L = \frac{T^2 g}{4\pi^2 \left(1 + \frac{1}{2}^2 \sin^2 \frac{\phi}{2} + \left(\frac{1}{2} \cdot \frac{3}{4}\right)^2 \sin^4 \frac{\phi}{2} + \ldots\right)}$$

For small angles the expression between the parenthesis is practicaly equal to one, therefore,

$$L = \frac{T^2 g}{4\pi^2}$$

T=3.6 sec. g =981 Cm.

L=323 Cm. or 10.6 feet.

On account of the mass of the pendulum not being actually concentrated at the lowest point, the length will be actually two or three inches longer, acording to the weight of the different parts.

How "Pacific Service" was Explained to the Chinese Rebel General

GENERAL LAN TEIN WEI, Commander of the revolutionary forces in Northern China during the uprising that resulted in the overthrow of the Manchu dynasty, and Sun Fo, the son of Dr. Sun Yet Sent, first President of the Chinese Republic, were entertained by the Pacific Gas and Electric Company during their visit to San Francisco in the early part of August.

The distinguished warrior had quite a party with him, including the Chinese Consul-General at San Francisco and the President of the Chinese Republican Association. Three ladies, Sun Fo's bride and two sisters, lent the grace of their presence. It was in a desire to show these people from the far away Orient the latest improvements in gas and electric power service that the company arranged what turned out to be a very enjoyable trip.

Automobiles took the party from their hotel to substation "C" on Jessie Street and thence to the Potrero, when the mechanism of the great steam electric generating plant was explained to them by Mr. Frank Varney. General Lan was most interested in all he saw and asked a number of questions. The two great turbines appeared to attract general curiosity, and by the interrogations put by various members of the party it was plain that the up-to-date Chinese is by no means ignorant of the modern principles of electric power generation, no matter how backward his own country may be in its application of them. And then, of course, came E. C. Jones, famed among famous gas men, who showed them the Potrero plant and the process of oil-gas manufacture.

The excursion wound up with a luncheon at Tait's Cafe at which George C. Holberton, Manager of the San Francisco District, presided. The table was decorated with an immense center-piece of red roses supporting American and Chinese flags, and the orchestra rendered Chinese music. When it came to toasting time both General Lan and Mr. Sun expressed their great appreciation of the courtesies extended to them and spoke in words almost too eulogistic to bear repeating here of "Pacific Service" as an enterprise.

Bostwick's "Braves" Bring Back Bacon

"Silk Hat Harry's" Team routs "Oom Paul" Downing's "Dandies" in Seven Inning Game by Score of 18 to 13

(As witnessed by our one expert, M. B. Mensing.)

THE main athletic event of the year was staged at St. Ignatius' College grounds, August 24th, between teams composed of Heads of Departments, and it proved to be the best and most exciting of the four games now played.

Superior stick work won for the San Francisco sluggers as in the first two innings they gathered nine runs on eleven healthy wallops. The Pacific team excelled in number of stolen bases and in fielding, but fell down when hits meant runs.

Mr. Britton again did the umpiring and his decisions gave entire satisfaction. (Natural enough as he is a Fair Director. Come on you 1915!)

Now that the war is over, boys, take a squint at the damage.

First Inning—Pacific—Downing led off with a single, Newbert followed with a double and stole third, Downing scoring. Lisberger reached first after catcher missed third strike. Newbert scored on this error. Cantrell went out, 2nd to 1st, Lisberger advanced to 2nd on this play and was thrown out attempting to steal third. Henley walked, stole second and tallied on Walton's drive to right field. Vensano singled to left; Bridges forced Walton at third for the last out. Four hits—three runs.

First Inning—San Francisco—Just to show there was no ill feeling, Pitts, the first "Brave" up, uncorked a drive which netted him two sacks while Caine followed up with a hit to right field and was later caught leading off first base. "Heap Big" Chief White got on first through catcher's error and Pitts scored. Frank Varney was out short to first. With two out, Bob Varney propelled one half way to the Cliff House for the limit, scoring White ahead of him. Bostwick continued the fireworks with a hit to left. Henley scrambled Thompson's grounder and Bostwick came in. Later Thompson scored on passed ball. Keppelmann hit to right and Coleman struck out. Five hits—five runs.

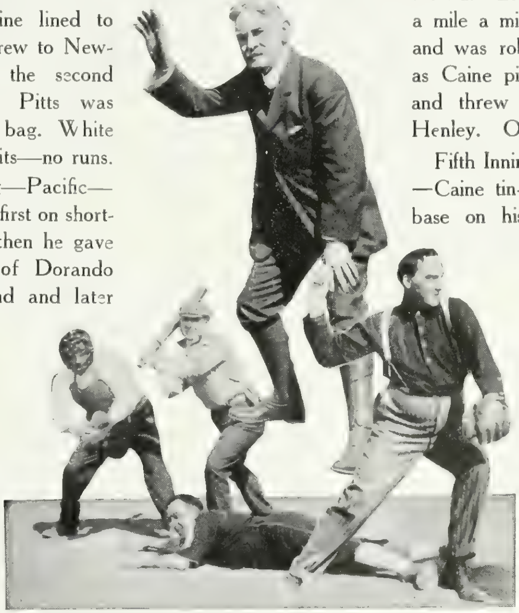
Second Inning—Pacific—Wise out, pitcher to first base. Downing singled, stole second, reached third on passed ball and scored when Newbert was safe on pitcher's overthrow of first base. Lisberger again reached first due to Keppelmann's failure to hold third strike. Cantrell out, pitcher to first, Newbert scored. Henley singled and Lisberger registered the third run for this inning. Walton waltzed to first and then Vensano spoiled the parade by forcing Henley at third base. Two hits—three runs.

Second Inning—San Francisco—Pitts led off with a single and rambled to second. Caine drew four wide ones. White hit into double play engineered by "Messrs." Wise, Newbert and Downing, pinching the Chief at Station No. 1 and nabbing Pitts a few feet from home. The Varney brothers, Bostwick, Thompson and Keppelmann obliged with a safety apiece which chalked up a cluster of four markers. Coleman, after taking his "three healthies," sat down and this session was over. Six hits—four runs.

Third Inning—Pacific—Butler now pitching for San Francisco. Bridges got life on error by pitcher, actually stole second (he's some speed burner for a heavyweight) and trotted in on "Jim" Wise's single to right. Jim went to second when Varney couldn't bend over far enough to pick up Downing's easy roller toward third. Wise took a hop, skip and jump and landed at third. Newbert went out, pitcher to first base. Lisberger's single brought in Wise and Downing. Cantrell out, short to first. At this juncture, Henley connected with one of Butler's fast (?) ones and clouted it into the center field bleachers for a two bagger which scored Lisberger. Walton hit to Bostwick and was out at first base. Four runs—three hits.

Third Inning—San Francisco—The side was retired in one, two, three order this frame. Pitts got life on Henley's error. Caine lined to Lisberger who threw to Newbert completing the second double play as Pitts was caught far off the bag. White struck out. No hits—no runs.

Fourth Inning—Pacific—Vensano reached first on shortstop's error and then he gave us an imitation of Dorando by stealing second and later on stealing home while Butler and Keppelmann were talking the situation over in the center of the diamond. Bridges popped up to second base and then Wise came through with a two bagger along left field foul line; stole third and scored on Downing's third hit. Newbert reached first on second baseman's error and Lisberger singled, filling the bases. Cantrell flew out to centerfield and a moment later Downing was caught off third base by throw from pitcher. Three hits—two runs.



John A. Britton Umpiring; Gus White Fielding; Harry Bostwick Batting; Paul Downing Catching, and Keppelman Doing a Kelly Slide.

(Photo Loaned by San Francisco "Call.")

Fourth Inning—San Francisco—Frank and Bob Varney singled and doubled respectively, the former scoring. Bostwick received base on balls. Thompson sapped the horsehide over the third baseman's head, tallying Bob Varney and Bostwick. Keppelmann struck out. Butler out, via the Wise and Newbert route. Pitts popped to Newbert. Three hits—three runs.

Fifth Inning—Pacific—Henley started off with a single; Walton out, short to first; Vensano out, third to first. Henley went to second. Bridges slammed one a mile a minute to centerfield and was robbed out of a hit as Caine picked up the ball and threw to third, catching Henley. One hit—no runs.

Fifth Inning—San Francisco—Caine tin-canned to second base on his hit to left field and stole third. White singled and while he was being tagged out between first and second Caine scored. Frank Varney singled and went to second when Brother Bob was hit by a pitched ball. They each advanced a base on passed ball. Bostwick popped to Newbert. Thompson hit safely and the Varneys breezed in. Thompson showed a burst of speed by stealing second and third, afterwards scoring on passed ball. Keppelmann fanned. Four hits—four runs.

Sixth Inning—Pacific—Lusk rolled one to pitcher and was out at first base. Downing lined out a two sacker, and went to third on Newbert's infield out. Lisberger ended inning by flying out to Caine. One hit—no runs.

Sixth Inning—San Francisco—Butler struck out, Pitts hit one "where they ain't" and hooked second and third. Caine kicked in with his second two bagger which sent Pitts in. White reached first on fielder's choice and was out attempting to purloin second. Cantrell booted Frank Varney's offering and Henley failed to handle Bob Varney's and Caine stalked in. Frank Varney was caught at the plate on Bostwick's tap to the short stop and the side was retired.

Seventh Inning—Pacific—Cantrell cantered to first on shortstop's error and was forced at second by Henley. Henley got caught at third by throw from shortstop. Wise, who replaced Walton singled, stole second and third and scored the last Pacific run while Foote reached first on fielder's choice. Foote hot-footed to second and later was within a foot of home plate when for some reason he put on the reverse, retraced his footsteps to third where he had a fine unobstructed view of Jollyman striking out, which wound up the game.

The game was played all over again during the usual banquet given the same evening at a down-town cafe, and everybody had a perfect eating average, even though their fielding and batting averages might have suffered during the afternoon fracas. Captain Bostwick made a modest little speech.

The Score:—

PACIFICS

	A.B.	R.	B.H.	P.O.	A.	E.
Downing, c	5	3	4	8	1	2
Newbert, 1st	5	2	1	6	1	0
Lisberger, 2nd	5	2	2	1	2	0
Cantrell, 3rd	5	0	0	1	0	1
Henley, ss	5	1	3	1	2	3
Walton, lf	3	0	1	0	0	0
Vensano, cf	4	1	1	0	0	0
Bridges, rf	4	1	0	0	0	0
Wise, p, & lf	4	3	3	1	1	0
Lusk, p	1	0	0	0	1	2
Foote, cf	1	0	0	0	0	0
Jollyman, rf	1	0	0	0	0	0
Totals	43	13	15	18	8	8

SAN FRANCISCOS

	A.B.	R.	B.H.	P.O.	A.	E.
Pitts, 2nd	5	2	3	2	2	1
Caine, cf	4	3	3	2	1	0
White, 1st	5	1	1	11	0	0
Varney, F. 3rd	5	3	3	4	1	1
Varney, R. lf	4	4	3	0	0	0
Bostwick, p, & ss	4	3	2	0	7	3
Thompson, rf	4	2	3	0	0	0
Keppelmann, c	4	0	2	2	2	4
Coleman, ss	2	0	0	0	0	0
Butler, p	2	0	0	0	3	1
Totals	39	18	20	21	16	10

SCORE BY INNINGS.

	1	2	3	4	5	6	7
Pacific's	3	3	4	2	0	0	1—13
Base Hits	4	2	3	3	1	1	1—15
San Francisco	5	4	0	3	4	2	x—18
Base Hits	5	6	0	3	4	2	x—20

SUMMARY.

Two-Base Hits—Newbert, Wise, Downing, Henley, Pitts, R. Varney, Caine, 2.

Home Run—R. Varney.

Stolen Bases—Downing, 2; Newbert, 1; Lisberger, 1; Cantrell, 1; Henley, 3; Vensano, 2; Bridges, 1; Wise, 4; Foote, 1.—Total 16. Pitts, 3; Caine, 2; Bostwick, 2; Thompson, 3; Keppelmann, 1.—Total 11.

Base on Balls—Off Wise, 2; Bostwick, 2.

Struck Out—By Wise, 4; Lusk, 2; Bostwick, 2; Butler, 1.

Double Plays—Lisberger to Newbert; Wise to Newbert to Downing.

Time of Game.—1 hr. 40 min.

Umpire—John A. Britton.

Scorer—M. B. Mensing.

Innings Pitched—By Bostwick, 2; Butler, 5; Wise, 4; Lusk, 2.

SHORT CIRCUITS

Several big league scouts and an ivory dealer were in attendance. I think the latter overlooked several bets as two or three plays assured us that there was good material for piano keys close at hand. Why go to Africa?

Newbert in a baseball uniform belonging to the San Mateo Elks, played a "bear" of a game at the initial sack.

Mr. Foote, the Secretary, ought to put up a good game as he has had a lot of practice with the "Seals."

M. B. M.

ITEMS OF GENERAL INTEREST

Chief Downing of the O. & M. Department, Hydro-Electric Section, has started a campaign of education among his youthful subordinates at the various power plants. He has arranged for different men of the company both in and outside of his department to visit the power-houses and substations throughout the entire system and give illustrated talks on hydro-electric development according to "Pacific Service."

A start was made at Oakland on the evening of Tuesday, August 20, when Load Dispatcher Fred George was the star performer. It was a great success, and all the employes of Station "C" enjoyed hearing about what was going on elsewhere in the vast territory over which the Pacific Gas & Electric Company operates. In explaining his purpose Engineer Downing says:

"These are not to be lectures, but talks. The idea is to tell the fellow at Colgate what things are like at deSabla, Electra, and elsewhere, thereby interesting as well as educating all the boys in the great development work we are doing."

It is the intention of "Pacific Service" management to make this campaign of education general throughout the company. On the evening of Wednesday, August 28th, the employes of San Francisco and Oakland Districts and their friends enjoyed an illustrated lecture by General Manager John A. Britton in the ball room of the St. Francis Hotel. In this Mr. Britton traced the history of gas and electric development in California from the beginning down to the present time, and with the aid of a series of excellent stereopticon views his audience was enabled to gain a considerable insight into the achievements of our enterprise.

The lecture is billed for repetition at the McDonough Theatre in Oakland on the evening of Wednesday, September 11th.

Mr. G. E. Lanz, an electric lighting expert in the employ of the Pacific Gas and Electric Company, visited San Mateo recently and inspected the lighting of business houses using the company's electric service. The inspection was made for the purpose of giving consumers advice regarding the proper use of improved lamps and reflectors so that the best possible lighting service will be obtained by the company's patrons. Improvements are constantly being made in the company's generating and distributing system. No matter how efficient the system may be, unless proper lanmps and reflectors are installed by consumers they pay more and get less, whereas the company believes that the reverse should obtain. It believes that satisfied customers are its greatest asset.

An expenditure approximating $30,000,000 has been authorized to cover the reconstruction of lines in the Woodland District. This action on the part of the company will tend toward materially improving the service in Woodland and vicinity and is in keeping with the policy of the company toward bringing its service to a high standard of efficiency and rendering "Pacific Service" in the full sense of its meaning.

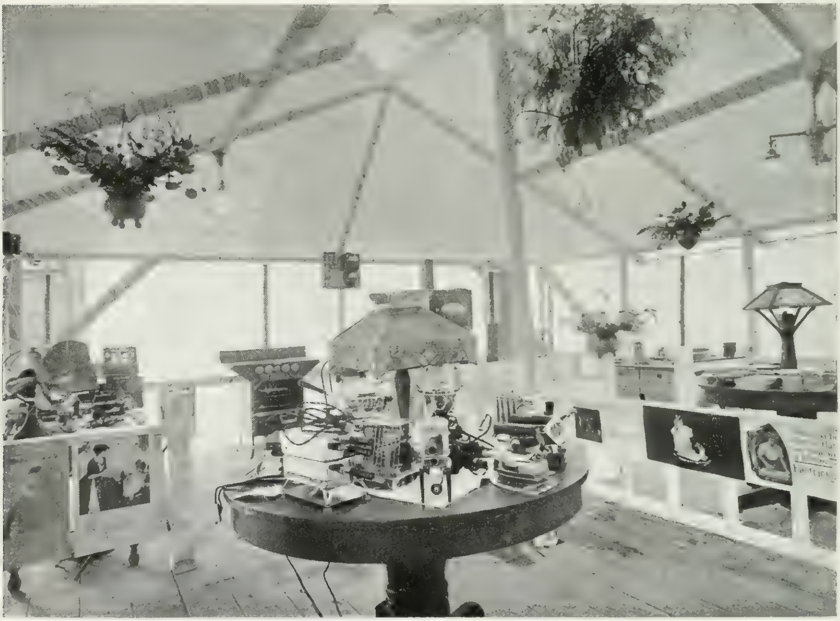
On August 5th service was cut in for the Arboga Colonies, located South of Marysville. This entire tract of several thousand acres is being settled almost entirely by Swedes, who have built a large hotel, a church and a schoolhouse, and altogether they form a big colony. The tract they occupy consists of very rich bottom land and will be devoted principally to the growing of small fruit and garden truck.

"Pacific Service" again won the gold medal for the most artistic display at the

Sebastopol Apple Show. Concerning this Mr. George S. Pearson of the Appliance Department at Santa Rosa writes: "The exhibit consisted of a booth fitted up as a complete gas and a complete electric kitchen. The decorations were all in white with an outline of electric lights on one side and Reflex gas lamps on the other. Across the front a large electric sign read 'Pacific Service.' On the top a 500 watt Mazda lamp was installed. The interior lighting showed the use of Mazda lamps and Holophane shades on one side, on the other a nice installation of Reflex lamps with Holophane and Alba shades was shown. In addition to a complete installation of gas for domestic purposes, an electric range and a large number of small electric appliances were on display. An electric washing machine in operation received a great deal of attention from the ladies.

"All the visitors were served with cookies baked by electricity and apples baked with gas. Mrs. Withers not only cooked all of the food served but made a number of interesting talks on the use of gas and electricity in the home.

"The greater number of the visitors were from the farming districts supplied by the Pacific Gas and Electric Company as well as the towns close to Sebastopol. They were very much interested in the small electric appliances and paid particular attention to electric irons and toasters. During the fair a number of orders were taken for electric irons and several gas ranges were sold. A number of inquiries were made regarding interior lighting as well as several about industrial gas. These were either taken care of at once or appointments made for some later date. Many inquiries were made as to cost of operation of the electric range compared



''Pacific Service'' Booth at Sebastopol Apple Fair to gas and full information was given in each case.

"During the first six days of the show an average of two thousand people a day were served at the booth.

"In addition to supplying all of the electric light, power and gas used in the show free the company decorated two blocks of Main Street with stringers of electric lights."

Manager Poingdestre writes from Marysville that the company's lines are to be extended 3½ miles from Live Oak to supply a number of consumers with power and lighting service. This part of the district is being well extended. A vigorous campaign for house wiring is being waged among the ranchers in Sutter County.

"Let your light so shine that it will eventually illuminate all of this county," writes Brother Poingdestre.

On the night of August 30th fire destroyed a livery stable at 26th and Broadway, Oakland, burning off a part of the roof and the upper structure of an adjoining laundry. The fire destroyed the electric wiring in both buildings, but in the laundry there was an installation of gas arcs which went through the fire and water untouched and responded to lighting when the chain was pulled.

"Gas as usual the standby," writes Manager Frank Leach.

Camp No. 1, de Sabla Power Station, was the scene of a wedding on July 24th, when Miss Theodora Marguerite Warner, daughter of Mr. H. Warner of the Accounting Department, was united in matrimony to J. Raymond Thompson, a business man of Canville, B. C.

It surely was an ideal spot for such a ceremony, away up there in the Butte hills. Neither of the parties belonged there, for the bride was a school teacher of Los Angeles before she decided to change her name, while, as already stated, the bridegroom hails from the Pacific Northwest. But de Sabla was chosen by the young people on account of its being the temporary residence of the bride's parents and the result was a very attractive affair.

The wedding took place beneath a bell of ferns and flowers in an arbor of fir and cedar, and the glory of the stars that twinkled overhead was greater than that of the Japanese lanterns that were strung all around. The ceremony was conducted by the Rev. Dr. W. A. Hunter of the First Presbyterian Church of Chico and the bride was attended by Miss Marguerite Shand. None but the bride's parents and a few intimate friends were present. After a brief honeymoon in San Francisco and Seattle the young people left for their home in British Columbia.

During the early part of July while Miss Bessie Herlihy was on her vacation at Monte

Our office at Napa

Rio she slipped over to Occidental and was quietly married to W. E. Fitzpatrick. Both of the young people were employes of the San Francisco District. Although it was understood that the event was to take place in the near future news of the marriage came as a complete surprise to all their friends. Congratulations are now in order.

Superintendent George Scarfe, of the Nevada Power Division, returned on the S. S. Mongolia the other day from the Hawaiian Islands, where, in company with his daughter Ethel, he had been enjoying a well-earned rest. During his stay in Honolulu Mr. Scarfe inspected the construction work going on at Pearl Harbor and at the different army posts. An interesting feature of his visit to the dry dock was his meeting with Nelson Tyler, one of his old employes of the Nevada Power house. Tyler is now master mechanic at the dock.

Mr. Scarfe speaks enthusiastically of his trip and says that the islanders treated him most hospitably during the entire period of his stay among them.

Mr. F. S. Gray, Assistant Manager of the Contract Department, has been very seriously ill for some time past, but we are happy to announce that he is now convalescing and before very long expects to be himself again. In fact he has recovered so far as to be able to come down to headquarters for awhile every day.

On August 26th there arrived a little daughter to gladden the household of Mr. F. E. Hummel, of the Contract Department, San Francisco District.

Effective August 1st, 1912, Mr. T. J. Tobin was appointed accountant of the South Yuba District, vice E. L. Osborn, resigned.

From the President's office comes the announcement that Mr. John J. Valentine has been appointed Superintendent of Transportation, effective from and after September 4th. In the position created he will have charge of all vehicles in use in all districts and divisions, including horses and wagons, auto trucks and any other means of transportation used in the conduct of the business of the company. He will pass upon all requisitions for additional vehicles and will co-operate with all District Managers and Division Superintendents in analysis of existing conditions and recommendations for changes in methods of transportation.

Manager George C. Holberton of the San Francisco District left for the east September 4th to attend the annual convention of the Association of Edison Illuminating Companies which this year is being held at Arkansas Hot Springs.

Mr. Holberton is on the convention program for a talk upon the Development of Reclamation and Irrigation, and he has taken with him a number of lantern slides with which he will illustrate his address and incidentally show the people of the east what a great part "Pacific Service" is playing in the work of developing the natural resources of California.

Mr. Holberton will visit several prominent cities in the east before his return and altogether will be away about a month.

With the approval of the Railroad Commission the Pacific Gas and Electric Company has acquired all the property formerly owned and operated by the Los Gatos Ice, Gas and Electric Company, which has been distributing power to the people of Los Gatos and vicinity. The purchase price was $187,762.50.

The newly acquired property has become part of the San Jose District of "Pacific Service" and is under the direction of District Manager John D. Kuster.

Manager John D. Kuster of the San Jose District reports the appointment of A. E.

Caldwell as Chief of the New Business Department of that District. The appointment is given in recognition of the excellent record made by Mr. Caldwell as a solicitor for power business.

A feature of the gathering of the Jovian Lunch Club of San Francisco, on September 3rd, was an address by Mr. George C. Holberton upon the work of the Pacific Gas and Electric Company, illustrated by lantern slides. Great interest was displayed by the San Francisco Manager's audience in the new development in progress at Lake Spaulding and Bear Valley, some excellent pictures affording a comprehensive idea of this newest and greatest "Pacific Service" project.

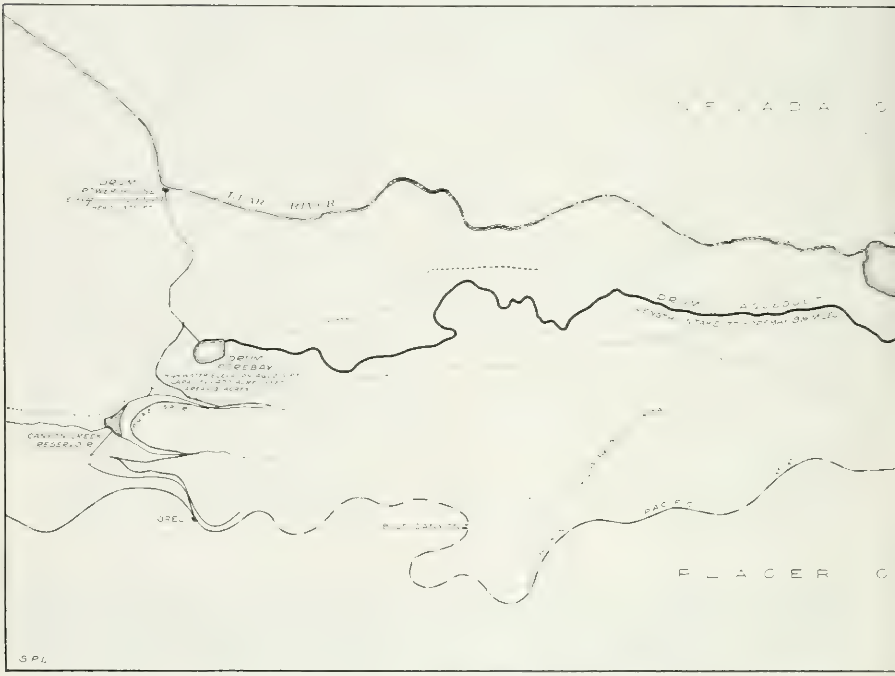
Mr. T. E. Bibbins of the General Electric Company presided. The following were elected officers for the ensuing year: R. M. Alvord, W. W. Hanscom, F. H. Woodward, W. S. Hanbridge and F. H. Ross.

Attention is called to the handsome office at Napa, where a big electric sign "Pacific Service" speaks for the up-to-date alertness of District Manager O. E. Clark.

In the August number of the magazine attention was called to the handsome window display in the Santa Rosa District office, taking the form of a miniature representation of the Sacramento Valley and San Francisco Bay, with the snow-clad Sierras in the distance and showing pole lines run from power houses down the valley and through the foothills to Santa Rosa.

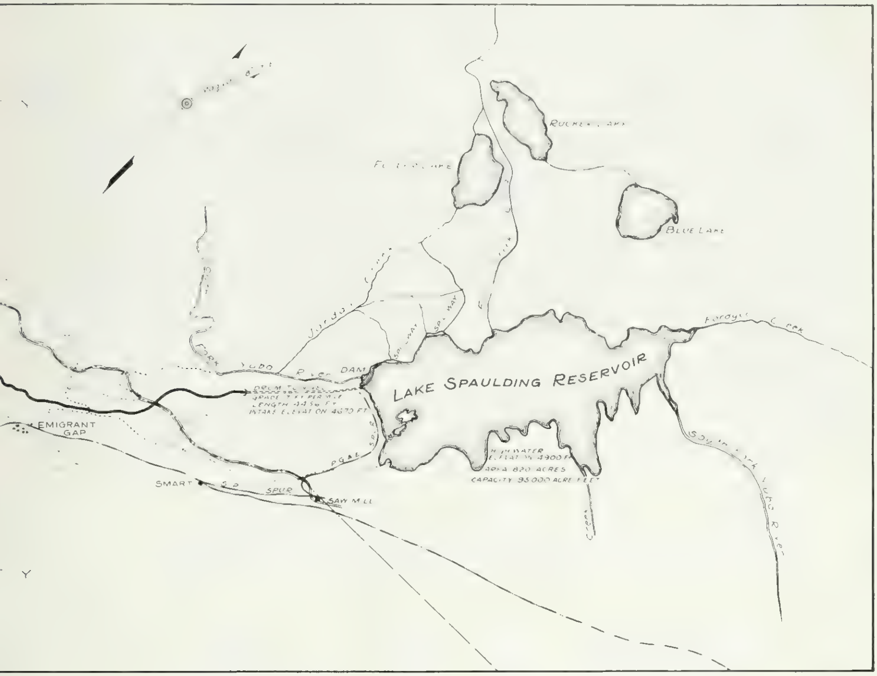
The reader may gain some notion of the effectiveness of the display from the accompanying picture.

Display window in Company's office at Santa Rosa



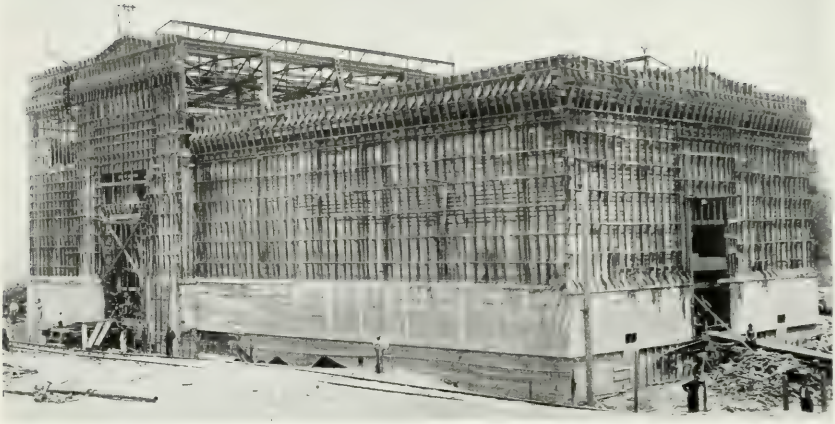
Map of the District Covered by the South Yuba—Be

View of the Country Surrounding Lake Spaulding, Showi



elopment Now in Progress in the High Sierras.

Water Mark of the 30,000,000,000 Gallon Reservoir.



Sacramento River Station in process of construction

The New Sacramento River Station

BY the time this number of the Pacific Gas and Electric Magazine reaches its readers the new River Station at Sacramento will, in all probability, be in active operation.

This undertaking is one of the many by which the Pacific Gas and Electric Company aims to make "Pacific Service" all that it is advertised to be. Its purpose is to protect the rapidly growing city of Sacramento against possible interruptions in service due to accidents on the pole line. The handsome building which will stand for all time as a monument to "Pacific Service" enterprise is situated north of the railroad depot at the capital city on the river bank, close to the junction of the American and Sacramento Rivers. It is a building with a steel frame with re-inforced concrete walls, and its design is one of the best achievements of that gifted architect, Willis Polk. The cost, all told, will be in the neighborhood of $750,000.00.

The equipment of this new steam station will consist of a 500 kilowatt turbine generator and six 826 horsepower Sterling boilers designed for 200 lbs. working pressure at 100 degrees superheat. From this staion steel towers have been erected over the company's new right of way to the 60,000 volt line running down from the mountains, a distance of 2½ miles. In addition, wires have been laid underground to the company's city station at 6th and H Streets, whence the electric current is distributed for city purposes, including that supplied for the street railroad system.

In the next number of the magazine will appear a full description of this new station by Fank H. Varney, the Engineer in charge of the Steam Section of our Electrical Department.

Don't Forget to Smile

Jolly the fellow who's down today,
Give him a smile for his sorrow;
The world sometimes has a funny way,
And you may be down tomorrow!

We're All Going to San Diego

"PACIFIC SERVICE" will be well represented at the 20th Annual Convention of the Pacific Coast Gas Association which will be held at San Diego on the 17th, 18th and 19th of September. This promises to be one of the most successful gatherings yet held by the Gas men of the West, and no doubt the charm of the beautiful old city of the sunny southland will play a part in attracting a large and representative attendance.

Secretary John A. Britton has been working industriously fo some time past sending out notices and warnings to the membership of the association and a first-class program has been prepared as will be seen from the following:

President's Address	William Baurhyte
Commercial Gas Illumination	W. T. Pease
Calorific Value of Oil Gas	F. S. Wade
Welding of High Pressure Pipe Lines	Leon B. Jones
Quality of Fire Bricks for Use in Oil Gas Machines	D. J. Young
Reasonable Gas Rates and Their Determination	Prof. C. L. Cory
Perfect Service	C. P. Houghton
Should Gas Companies Engage in the Sale of Appliances (Composite Paper)	L. H. Newbert and H. P. Pitts
Sale of Gas Appliances by a Small Gas Company	F. A. Cressey, Jr.
Present Status of Gas Engineering in American Universities, and Some Suggestions for a Specialized Course on the Pacific Coast	Prof. Robert Sibley
Wrinkles	F. C. Millard
Experiences	Wallace H. Foster
Novelties	R. L. Clarke

The meetings will be held in the assembly room of the Grant Hotel, and will be called to order promptly at ten o'clock a. m., September 17th.

The banquet will be held in the Grant Hotel on Wednesday evening, September the 18th, at seven o'clock.

On the evening of the banquet the ladies of the party will be the guests of the San Diego Consolidated Gas and Electric Company at a theatre party.

On Tuesday, September 17th, and Wednesday, September 18th, the ladies of the party will be entertained by automobile sightseeing trips in and around San Diego.

On Thursday, September 19th, the members of the Association and ladies accompanying them will be taken in automobiles to all points of interest in and around San Diego as guests of the San Diego Consolidated Gas and Electric Company. The party will leave the Grant Hotel at nine o'clock a. m., on this trip, returning to the Grant Hotel at noon, where luncheon will be served.

After luncheon, the party as guests of the United Light, Fuel and Power Company will be taken for a trip around San Diego Bay, returning to San Diego at five o'clock p. m.

On Thursday evening, September 19th, a ball will be given at the Grant Hotel by the San Diego Consolidated Gas and Electric Company for the members of the Association ladies of the party and invited guests.

Cook with Gas!

Breakfast can be always ready;
Hubby never need be late,
For the heat is sure and steady,
So he doesn't have to wait.

Or you're in a hurry, may be,
To prepare the nursery meal;
Well, the milk is warm for baby
'Fore he has a chance to squeal.

While for baking bread that's crusty,
Or for cake, or roasting meat,
There's no other stove as trusty
For well-regulated heat.

So the household life is peaceful,
Filled with comfort, ease and love;
If the work is thus made easeful
With a Good Gas Stove.

C. M. Converse.

Pacific Gas and Electric Magazine

PUBLISHED IN THE INTEREST OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON	EDITOR-IN-CHIEF
FREDERICK S. MYRTLE	MANAGING EDITOR
A. F. HOCKENBEAMER	BUSINESS MANAGER

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

VOL. IV SEPTEMBER, 1912 NO. 4

EDITORIAL

ON OCTOBER 15TH THE REGULAR quarterly dividend on the common stock of the Pacific Gas and Electric Company will be paid to the stockholders who are of record on September 14th.

Concerning this the following is taken from the San Francisco "Wasp" of September 7th:

"This contradicts in the most convincing manner a newspaper report which emanated from Chicago that the dividend might be endangered by the issue of more bonds. Undoubtedly the report was floated by stock jobbers who desired to fix the market value for their own purposes.

"Not only will the regular monthly dividend on Pacific Gas and Electric common stock continue to be paid but the prospects are favorable for an increase of the dividend from $1\frac{1}{4}$ to $1\frac{1}{2}$.

"The present management of the Pacific Gas and Electric Company is an object lesson to public service corporations. There is no complaint of its methods, for the company strives earnestly to give complete satisfaction to the public and treat everybody courteously and fairly. Time was when irresponsible understrappers of public service corporations swaggered around and made trouble for their employers by their insolent demeanor. No such conduct is tolerated by the Pacific Gas and Electric Company. Its employes are instructed to treat the public as their patron, and not their servant, and to be polite and obliging in the discharge of their duties.

"The result of this wise policy is that at a time when the country is filled with demagogues raging about the arrogance and unfairness of corporations in general, and public service corporations in particular, nothing but what is creditable is heard of the Pacific Gas and Electric Company.

"If Public Service corporations, generally speaking, were managed with the same regard for public opinion that characterizes the management of the Pacific Gas and Electric Company, there would be less talk of public ownership of public utilities, which public ownership is only desirable when the management by corporations becomes insufferable."

The "Marysville Spokesman" comments upon the fact that a representative of "Pacific Service" has been going the rounds of the company's patrons in that city investigating the system of lighting used by its consumers and making suggestions for improvement and saving of expense, and doing all this expert assistance without any cost to the consumer.

The "Spokesman" regards this incident as illustrative of a distinct change in demeanor toward the public on the part of public service corporations, at the same time observing:

"The Pacific Gas and Electric Company is wise in its day and generation. Its present policy cannot but redound to its benefit, and if it sells a little less "juice" it will have far less complaint, and a far better and more satisfied constituency. The policy it is following is so admirable that we would say to all other public corporations 'Go thou and do likewise.' "

It is pleasant indeed to read comments of the description quoted from the press of the State. It is no more than right that a great public service corporation that aims to deal fairly and honestly by its patrons and seeks in return no more than a just and equitable return upon its investment should have at least a fair field, if no favor, from those whose business it is to watch the progress of events for the benefit of the public at large.

Mr. H. M. Byllesby, in a recent review of "Water Power Companies as Investments," protests against what he terms" the unjust federal and state interference with the development of hydro-electric projects," and says that the present course of the federal government toward the development of water powers in the west is greatly retarding the utilization of these undeveloped powers. He states that with the present laws the conditions, broadly and generally, under which a permit will be given are that the developing company may erect its plant and distribution lines, costing several millions of dollars, allowing the company to occupy the stream for a limited period of 20 or 40 years.

Along this line he says:

"In yielding water power privileges to corporations on the public domain no company will object to the payment of a fair and proper royality on the water used, but we do object to following a policy as outlined by men who, as a rule, have accomplished nothing in the world excepting as to politics, who could not either devise such a project as they are now legislating against or who, if they could devise such a project, would know of no nook or cranny in the wide world where they could command sufficient credit to a raise a dollar toward it."

The Pacific Gas and Electric Company has just won an important victory in the Supreme Court, in a decision ordering a new trial of the case of Eliza J. Schwartz vs. Pacific Gas and Electric Company.

The case has been pending in the courts for four years and has been the subject of one of the hardest legal battles in the history of the State. It arose over an injury to a blooded horse known as "Joe Terry." In April, 1907, the horse was at pasture in a field near Woodland, when it stepped upon some sharp object and cut one of its hind legs so badly as to become permanently crippled. Mrs. Schwartz claimed the horse stepped upon a broken insulator thrown into the field by linemen.

The company did not believe that the horse was injured in this way and rejected a claim for damages made by Mrs. Schwartz. An action was then brought in Yolo County and the case tried in Woodland. Mrs. Schwartz claimed that the horse was of blueblood and worth $15,000. A jury, actuated apparently more by the fact that the defendant was a corporation than by the evidence presented, return a verdict in her favor for $6,470.

The company at once attacked this verdict in the Appellate Courts as excessive. It showed by affidavits of former owners of the horse that while he was of thoroughbred stock, he never sold for more than $650. In fact on one occasion, he brought only $100, and Mrs. Schwartz herself proved to have purchased him for $37.50 and a $35.00 feed bill.

The case was twice heard in the Court of Appeal in Sacramento and then in the Supreme Court. The final decision was in favor of the company, the verdict of the jury being set aside and the case sent back for a new trial.

It is not known whether Mrs. Schwartz will attempt to have the case retried, but if she does, it will be again vigorously defended. The company has always considered the claim unjust, and where it believes unjust demands are made it is as willing to fight to the last ditch as it is to pay and settle just and honest claims freely and expeditiously.

Noting Progress of the World's Fair

THE "Flying Legion," by which title is known the company of business and professional men of San Francisco who are obligated to do the work of boosting for the Panama-Pacific Exposition, invaded British Columbia last month and received the most hospitable of welcomes.

It was, perhaps, a rather ticklish proceeding to enter British territory at a time when there appears to be some misunderstanding regarding the duties and obligations of the United States in building and operating the Panama Canal, but if those Britishers up North entertained any feeling upon this question they kept it right down deep in their innermost beings and never for one moment allowed even a speck of cloud to obstruct the sunshine of their genial hospitality.

The Legion went up there one hundred and one strong and in the party were men known to fame throughout the world. Mayor Rolph went along and stayed with the party long enough to make an excellent impression upon the people of Victoria. Dr. A. H. Giannini, the San Francisco Supervisor, went as the official representative of Governor Johnson and acquitted himself right royally. Luther Burbank was, perhaps, the star attraction. Everywhere the Legion went its hosts wanted the wizard of horticulture pointed out to them, and they were much taken with his affable yet modest demeanor. President Wheeler of the University of California was another whose fame had been heralded far, and he found himself in constant demand for addresses throughout the entire trip. It may be said, in fact, that the personnel of the delegation, under the leadership of Chairman Frederick J. Koster and W. L. Hathaway, was representative to a degree of San Francisco in its greatest and best interests, and in the list must not be forgotten the Rev. Dr. Clampett who, with his ready wit and sunny disposition, made friends wherever he went.

The Legion left San Francisco on the afternoon of Thursday, August 22nd, journeying direct to Seattle by special train. There the invaders were met by a committee from Victoria who acted as their escort on the short sea-voyage. Rooms had been reserved at the Hotel Empress in Victoria and immediately upon arrival there was a great luncheon at which Sir Richard McBride, Premier of British Columbia, made the address of welcome. The same evening there was a formal reception at the Parliament buildings, where Sir Richard and Lady McBride did the honors, pending the arrival of Lieutenant-Governor Patterson. This was a very graceful affair, and visitors and hosts mingled in friendly intercourse until quite a late hour.

The four and a half days spent in Victoria were taken up with trips through the lumber camps on the Jordan River, the coal mines at Nanaimo, and various amusements. On the last day President Wheeler was guest of honor at a luncheon of the Canadian Club and there delivered an address which carried words of more than ordinary significance to British ears. He spoke of Emperor William as an apostle of peace, who maintained a great army and who is building a great navy not for purpoes of aggression but of protection. It is not colonies that Germany wants, said President Wheeler, but an expansion of her trade, and she means to get that peacefully, if she can, but she will not permit any arbitrary interference from outside powers.

"I know," said President Wheeler, impressively, as the audience hung upon his words. It sounded like a positive assurance from the "inside."

A day was spent in Vancouver and there the Legion again spread its message of brotherly regard with indubitable success. Needless to say the visits made to Seattle, Tacoma and Portland on the return journey were incidents of unalloyed pleasure. It was an

Members of the "Flying Legion" Leaving the Hotel Empress at Victoria for the C. P. R. Steamer in Wheelbarrows.

enjoyable trip from start to finish and it was the consensus of opinion among the members of the "Flying Legion" that it was thoroughly worth while. The entire trip occupied just ten days.

Meanwhile things at home have been booming. Plans for the Service Building, the first structure to be erected on the exposition site at Harbor View, have been completed. This structure will be three stories in height and will cost in the neighborhood of $60,000.00. It will be 150 feet square with a interior court of 58 x 104 feet. It will face Fillmore Street and will be about 200 feet west of that thoroughfare. It will be a frame structure, covered on the outside with lath and plaster, and its appearance will recall the early California style of architecture. In this will be located the entire organization of the Exposition, even to the Police Department, the Commander of the Guards and the Emergency Hospital.

The Architectural Commission held a session in San Francisco during August and discussed plans. Besides the local architects there were present William R. Mead, W. C. Richardson, Theodore Blake and Henry Bacon, all of New York. At the close of the session Mr. Bacon made this observation: "I am convinced that the plan adopted by the Commission is one of the best yet devised for an Exposition, and the public will be surprised at its excellence. In the province of design we have struck gold, pure gold."

The work of filling in the Harbor View site is all but completed, and remarkable progress has been made in raising the grade where the State Buildings, Drill Grounds and Live Stock Exhibits are to be located.

Palm trees weighing 4,500 pounds are being planted in Lobos Square in readiness for the exposition, by a squad of men under the supervision of landscape gardener John McLaren. More palms are needed and owners who are desirous of donating them should notify the Exposition. At the close of the World's Fair these trees will be removed to Golden Gate and other parks of the city.

France was the first of the European powers to accept President Taft's invitation to participate in the exposition. Official notice of this was received by President Moore early in August. The Imperial Japanese Commissioners are expected to select a site for their country's exhibit on September 18th. Cuba has sent word of her intention to join in the exposition and the plans of the Hawaiian Commission promise a display far surpassing anything of the kind ever made by islands of the Pacific.

Word received by the United States Embassy in London last month from the British Foreign Office would indicate that desipte the possible misunderstanding alluded to Great Britian will surely be a participant.

Rafael Hernandez, Minister of Finance of the Republic of Mexico, arrived here September 1st as the forerunner of a Governmental Commission which is expected to arrange for Mexico's participation. Last, but by no means least, the assurance that Germany is eager to exhibit here was brought by Banker I. W. Hellman upon his return from Europe last month.

In fact there is every reason to believe that Europe stands a solid unit for the exposition. Dr. Frederick F. J. Skiff, Director of Foreign Exhibits returned recently from Baden-Baden and gave positive assurance of universal participation.

F. S. M.

The Board of Directors have awarded the contract for the construction of the exposition fence to B. A. Stewart of Oakland, the lowest of twenty-three bidders.

President Chas. C. Moore has selected the following Exposition Reception Committee:

William T. Sesnon, Chairman; M. J. Brandenstein, P. T. Clay, Charles de Young, I. W. Hellman, Jr., Charles W. Hornick, Thornwall Mullaly, H. T. Scott, Charles S. Stanton, Frederick J. Koster, Robert I. Bently, C. H. McCormick, John Barneson, George Pope, Stanley Morsehead, Rolla V. Watt, A. C. Kains, Joseph D. Grant, Marshall Hale, Laurence Harris, Joseph D. Redding, Charles K. Field, James D. Phelan, J. K. Armsby, John S. Drum, J. J. Dwyer.

Allan Pollok, for the past year Comptroller of the Exposition, resigned last month. R. S. Durkee, Auditor of the Nevada Northern Railway Company was appointed as his successor.

Design of the Service Building, Panama-Pacific Exposition.

What the Press Has to Say

New Building for Sacramento

Class "A" Structure at K and Eleventh will take the Place of the old Offices Down Town

The City of Sacramento is to have a new Class A building from the windows of which the now well known circular trade mark of the Pacific Gas and Electric Company will be displayed.

The company has had this building in contemplation for some time past, and now the plans and specifications have been officially approved at headquarters and the work of construction will begin in the near future. It is to be a building that will reflect credit not only upon the light and power enterprise that is going to the expense of some hundred thousand dollars to erect and equip it, but also upon the fast-growing city of which it will be one of the most ornamental features.

The location is at the southeast corner of K and Eleventh Streets, with a frontage of fifty feet on the former and eighty feet on the latter thoroughfare. It will consist of four stories and basement, and as will be seen from the accompanying drawing, prepared by Architect E. C. Hemmings of Sacramento, it will be a handsome and imposing structure. It will be a full steel frame with terra cotta and pressed brick exterior.

GROUND FLOOR

The ground floor will contain the general public offices of the company, and here the bookkeepers and cashiers, solicitors and counter men will be located. Orders for service will be taken and bills paid here, also clerks will be at the disposal of visitors who may desire information regarding installations, rates, and everything else that concerns a public service corporation and the public it serves. These offices will present the appearance of a modern bank interior with high ceilings and paneled walls, marble floors, wainscots and counters and everything in keeping with a department devoted entirely to the transaction of the business of the public.

There will be a street railroad department on this floor where car tickets may be bought and lost and found articles restored and traced. There will be a ladies' waiting and rest room with telephones and directories. In short the convenience of the public will be studied to the utmost and the general scheme is to provide all the facilities of a modern department store.

The second floor will be devoted to a big appliance department where gas and electric appliances of all kinds will be laid out for display and sale, from the smallest electric curling iron to the largest hotel cooking range. Every modern device known to the gas and electric industry will be found here and a feature of the display will be a model kitchen which will be fitted up complete and should prove of immense interest to the public who are studying the problem of cooking from an economic as well as a scientific standpoint.

BUSINESS OFFICES

On the third and fourth floors will be located the business offices of the company where the manager and his staff will be found during office hours. In an undertaking like this which comprises a street railroad as well as a light, power and heat business there of necessity must be employed a large amount of help and with the staff which Manager McKillip at present has on hand it is safe to say that the third and fourth floors of this modern building will be found none too large for the housing of all the various departments and their employes.

The employes, by the way, are to be especially well-cared for in this scheme of new construction. In the basement of the buildthere will be a retiring room for employes. Here will be found also a deep well and a special pumping system from which pure water for drinking purposes will be piped all over the building. The roof of the structure will be designed as a sort of a roof garden where employes may eat their lunches. Health and comfort are to be studied everywhere.

The first floor will have an air-washed and cooled ventilating plant by which the temperature may be lowered twenty degrees at will. There will be one high-speed elevator and an electric lift. The stairs will be of marble and iron leading all the way up the building, and there will be fireproof vaults on all floors. In a word, the Pacific Gas and Electric Company's building at the corner of Eleventh and K Streets will be in every respect an up-to-date modern office building. No expense has been spared in preparing the very best plans available, and the specifications call for none but the very best material and style of construction. The whole is to do credit to "Pacific Service," by which term or slogan the Pacific Gas and Electric Company is now generally known throughout the thirty counties of the State of California covered by its operating system.

HOME INDUSTRY IDEA

It is proper to say here also that in the construction of this building home industry is to be patronized to the exclusion of all other. General Manager John A. Britton has given orders that all labor, material and supplies are to be of home production wherever possible to be obtained, and that no contracts whatever are to be entered into with eastern or outside persons where local talent is found available.

For a long time the company's offices have been housed in the now old-fashioned building at the corner of Second and J Streets. It has long been desired to make a change, and under the direction of headquarters in San Francisco and the local management at the capital city, Architect Hemmings and the contractors will go to work and make all possible speed toward the completion of this building that is to be a credit to the great railroad center of California.

Sacramento (Cal.) *Union*, August 4, 1912.

Orientals at Station "A"

General Lan and Party of Distinguished Chinese Entertained in a Visit of Inspection

Keen and intelligent interest in everything pertaining to modern progress was shown by Chinese notables who visited several of the plants of the Pacific Gas and Electric Company yesterday morning as guests of George C. Holberton, manager of the San Francisco district of the big public-utility corporation.

The party consisted of General Lan Tien Wei, commander of the revolutionary forces in Northern China and his staff officers, Dscho Sha Lian, Haou Tien Ou and C. P. Yin; Sun Fo, the son of Sun Yet Sen, first president of the Chinese Republic, his bride and his sisters, Sun Yuen and Sun On; C. J. Kee, a Chinese student who accompanied the Sun party to this country; Li Yeng Yew, Chinese Consul-General at San Francisco; Tong King Chung, president of the Chinese Republic Association, and Otto F. Schiller of the Downtown Committee of the Chamber of Commerce, by whom the trip was arranged.

Automobiles took the party from their hotel to Station C, in Jessie Street, where the mechanism of the great steam electric generating plant was explained to the visitors by Frank H. Varney, chief engineer of plants. At the Potrero gas plant the process of generating and storing gas was made plain by E. C. Jones, a noted gas engineer, who personally conducted the party over the plant.

The immense turbines were the features of Station A which attracted the greatest interest on the part of the Chinese, who plied A. R. Thompson, superintendent of distribution, with questions, showing quick perception and lively interest. A trip through the machine shops and ship yards of the Union Iron Works followed.

The entire party were guests of Mr. Holberton at a luncheon at the Tait-Zinkand Cafe, the details of which were arranged by F. S. Myrtle, head of the publicity department of the Pacific Gas and Electric Company. The table was decorated by an immense centerpiece of red roses supporting American and Chinese flags.

In the afternoon the general and his party were taken on an automobile tour of the eastern side of the bay by W. W. Keith, traffic manager of the Oakland Traction Company.

San Francisco (Cal.) *Examiner*, Aug. 3, 1912.

Bion J. Arnold Enters "Pacific Service"

Famous Street Railroad Expert Engaged to Look Over the Sacramento System

Bion J. Arnold, consulting engineer of Chicago, who is now conducting a comprehensive study of the transportation conditions and problems which confront this city, has been retained by the Pacific Gas and Electric Railway Company to investigate the railway transportation conditions of the company's system in Sacramento.

The Pacific Gas and Electric Railway Company is a subsidiary of the Pacific Gas and Electric interests, and operates practically all of the lines in and around Sacramento. For the purpose of bettering the service, the company has secured Arnold, who is to make a thorough investigation of the problems confronting the Central California city.

The work in Sacramento will be directed by J. R. Bibbins, resident engineer for Arnold, who is also in charge of the investigation of transpotation problems of San Francisco. Working under him will be a large corps of engineers and statisticians.

The work will be carried out on the broadest scope and the question of standards of service and equipment, improvements in the types of cars, re-routing, development of terminal facilities, and schedule and speed conditions will be gone into thoroughly.

This probably will be the first example on the Pacific Coast of a public-utility company voluntarily submitting to an examination of property apparently for the interest of its patrons. The company has advised the Municipal Commission of Sacramento of its action. In all probability the complete results of the investigation ultimately will be placed before the commission.

San Francisco (Cal.) *Examiner*, Sept. 2, 1912.

Service Extended in Fresno

The extension of gas mains further into Arlington Heights was announced yesterday by Manager W. M. Henderson of the Pacific Gas and Electric Company. The present mains end at Third and Washington Streets. Extensions will now be made out Iowa Street to Eighth Street; out First Street to the territory about Belmont and White Avenues, and out Washington and McKenzie to the territory about Sixth and Belmont.

The rapid growth of the Arlington Heights district has necessitated this extension. The mains will be high pressure, two-inch mains.

In addition to the large six-inch mains which will be laid in the downtown district for two blocks on J Street, two blocks on Mariposa Street and one block on I Street, large pipes may be laid beneath others of the downtown streets. Permission has been secured from the trustees to lay the five blocks of pipe, and they are to be laid at this time because these streets are to be re-surfaced. Work was expected to have begun by this time, but the non-arrival of materials has delayed the work. A construction superintendent is already on hand with a force of men awaiting the opening of the streets.

The growth of the city south and east requires more big mains in the downtown district, stated Henderson. Some of the old mains were laid as far back as 1883, and need replacing. Definite plans for these mains have not yet been laid.

Fresno (Cal.) *Republican*, July 30, 1912.

Praised in Editorial

The Pacific Gas and Electric Company of this city, under the efficient management of Wallace Foster, who, by the way, has some very up-to-date business ideas, recently announced a substantial reduction in rates for electric lighting. It isn't, I know, just the proper thing to commend a corporation for anything it might do—a corporation should always be condemned—if for no other reason just on general principles, or simply because it is a corporation, but in this case it seems to me that we might forget for the time being that the Pacific Gas and Electric Company is one of these "soulless" bodies and give them proper credit for their efforts to give the people decent service at reasonable rates, especially that the reduction was made after the Public Utilities Commission of the State has ruled the Great Western Power Company out of this field, thus giving the Pacific Gas and Electric Company a monopoly in this county. There are other corporations that I know of that I should like to extend thanks to should they adopt a similar policy. I fear, however, that I shall be denied the pleasure of extending any more thanks or writing any more words of commendation to a corporation doing business in San Rafael.

San Rafael (Cal.) *Tocsin*, Aug. 3, 1912.

New Water Mains for Stockton

The benefit of city water service is to be extended to the residents of McCloud's addition or North Stockton, as it is now known, and the City Homestead.

The Pacific Gas and Electric Company has ordered materials, and within the next sixty days will begin extending its water mains in McCloud's addition, completing the work before the winter season. Next spring the mains will be extended into the Homestead as far as the baths. Plans are also being considered for extensions into the Fair Oaks and such other sections as development warrants.

The company will sink several new wells to supply these mains. A third station will be established on the block bounded by Center, El Dorado, Jackson and Clay Streets. A 14-12 inch well for a 1000-foot depth has already been started at this station. At station One at Lafayette and East Streets, a 16-inch well is nearing completion, the drillers having but 140 feet to go to reach a depth of 1000 feet. This winter a fifth well will be sunk at station Two at Poplar and Monroe Streets. These wells will cost from $3000 to $5000 each, and will give the company an increased well capacity of 4,500,000 gallons per day, making the total capacity about 18,500,000 gallons per day. The present demand on the system is about 6,000,000 or 7,000,000 gallons per day.

Stockton (Cal.) *Record*, Aug. 2, 1912.

Union Iron Works Signs Up

Big Industrial Concern Decides to Retire from the Private Power-generating Business and go in with "Pacific Service"

There is considerable significance in the fact that the Union Iron Works has ceased manufacturing its own electric energy for power and lighting, and signed a contract with the Pacific Gas and Electric Company to supply it. The contract is for a term of years, and one of the largest ever made by the company.

This is the second victory for the hydroelectric idea in this city within a short time, the first being the decision of the city to buy power for the Geary Street road rather than manufacture it in a steam plant.

The plant of the Union Iron Works will be discontinued entirely, and the power and lighting for the machine shops, shipyards, drydocks, foundries, the charging of submarines, etc., will be supplied by the electric company.

San Francisco (*Cal.*) *Call*, August 1, 1912.

PACIFIC GAS AND ELECTRIC COMPANY

DIRECTORS

F. B. Anderson
Henry E. Bothin
John A. Britton
W. H. Crocker
E. J. De Sabla, Jr.
F. G. Drum
John S. Drum
D. H. Foote
Wm. G. Henshaw
A. F. Hockenbeamer
Samuel Insull
John Martin
C. O. G. Miller
Louis Sloss
George K. Weeks

OFFICERS

F. G. Drum	President	J. H. Wise	Asst. General Manager
John A. Britton	Vice-Pres. and Gen. Mgr.	D. H. Foote	Secretary and Asst. Treasurer
A. F. Hockenbeamer	2d Vice-Pres., Treas. and Comp.	Charles L. Barrett	Asst. Secretary
J. C. Love	Asst. Treasurer	W. R. Eckart	Consulting Engineer
F. G. Baum	Consulting Engineer		

HEADS OF DEPARTMENTS

M. H. Bridges	Auditor	W. B. Bosley	Attorney
W. H. Kline	General Agent	H. C. Vensano	Civil Engineer
R. J. Cantrell	Property Agent	E. C. Jones	Engr. Gas Dept.
George C. Robb	Supt. of Supplies	H. P. Pitts	Industrial Engineer
J. H. Hunt	Purchasing Agent	S. V. Walton	Manager Commercial Dept.
E. B. Henley	Manager Land Dept.	S. J. Lisberger	Engr. Electric Distribution
J. P. Coghlan	Manager Claims Dept.	Sherwood Grover	Asst. Engr. Gas Department
H. Bostwick	Secretary to President	J. P. Jollyman	Engr. of Electric Construction
F. S. Myrtle	Manager Publicity Dept.	P. M. Downing	Engr. O. & M. Hyd.-Elec. Sect.
L. H. Newbert	Manager Appliance Dept.	C. J. Wilson	Asst. Engr. Electric Distribution
G. C. Holberton	Chief Engineer Stockton Water Dist.	F. H. Varney	Engr. O. & M. Steam & Gas Eng. Sect.

DISTRICT MANAGERS

District	Headquarters	Manager	District	Headquarters	Manager
Alameda Co.	Oakland	F. A. Leach, Jr.	Petaluma	Petaluma	H. Weber
Antioch	Antioch	F. J. Southerland	Placer	East Auburn	H. M. Cooper
Berkeley	Berkeley	F. A. Leach, Jr.	Redwood	Redwood City	E. W. Florence
Chico	Chico	H. B. Heryford	Sacramento	Sacramento	C. W. McKillip
Colusa	Colusa	L. H. Hartsock	San Francisco	San Francisco	G. C. Holberton
Contra Costa	Martinez	Don C. Ray	So. San Francisco	So. San Francisco	Frank P. Edwards
Fresno	Fresno	W. M. Henderson	San Jose	San Jose	J. D. Kuster
Grass Valley	Grass Valley	John Werry	Santa Rosa	Santa Rosa	M. G. Hall
Marysville	Marysville	J. E. Poingdestre	Solano	Dixon	C. E. Sedgwick
Marin	San Rafael	W. H. Foster	Stanislaus	Newman	W. A. Widenmann
Napa	Napa	O. E. Clark	Vallejo	Vallejo	A. J. Stephens
Nevada City	Nevada City	John Werry	Woodland	Woodland	W. E. Osborn
Oakland	Oakland	F. A. Leach, Jr.			

MANAGERS OF WATER DISTRICTS

Colfax (Alta)	Jas. Martin	Placer (East Auburn)	H. M. Cooper
Nevada (Nevada City)	George Scarfe	Standard (Electra)	W. E. Eskew
Stockton (Stockton)	J. W. Hall		

SUPERINTENDENTS OF POWER DIVISIONS

Colgate	Joseph Mini	Oakland	William Hughes
De Sabla	I. B. Adams	Sacramento	J. O. Tobey
Electra	W. E. Eskew	San Jose	J. O. Hansen
Marysville	C. E. Young	South Tower	A. H. Burnett
Nevada	George Scarfe	Stockton	E. C. Monahan
North Tower	C. D. Clark	Solano	J.W. Coons

SUPERINTENDENTS OF STEAM ELECTRIC STATIONS

H. N. Mosher..............Chief Engr. Station "C," Oakland
C. A. Eastwood, Chief Engr. Station "A," San Francisco
T. E. Fogalsang, Supt. Generating Statn., San Francisco
J. W. Varney........ Supt. of Sub-Stations, San Francisco

SUPERINTENDENTS OF ELECTRIC DISTRIBUTION

Berkeley	J. H. Pape	Sacramento	C. R. Gill
Oakland (Underground)	R. C. Powell	San Francisco	A. R. Thompson
Oakland and Alameda (Overhead)	A. U. Brandt	San Jose	A. C. Ramstad
Valley District (Chico, Marysville, Woodland and Colusa)	W. F. Biedl		

SUPERINTENDENTS OF GAS WORKS

Martin Station	John Mitchell	Sacramento	Edward S. Jones
Oakland	A. C. Beck	San Francisco	Dennis J. Lucey
San Jose	R. H. Hargreaves		

SUPERINTENDENTS OF GAS DISTRIBUTION

Oakland	George Kirk	San Francisco	D. E. Keppelman
Superintendent of Railway Department	N. J. Hullin		

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	187	1,081,222
Gas	49	978,167
Water	10	45,825
Railway	1	60,000

Place	Population	Place	Population	Place	Population
Alta	20	Fairfield	834	Pacheco	200
[1] Alameda	25,000	Forestville	100	Penryn	250
[2] Albany	800	Felton	300	Patterson	300
Amador City	200	[1] Fresno	30,000	Penn Grove	300
Adams John	25	[2] Fair Oaks	250	[2] Petaluma	5,500
Alleghany	200	Folsom	1,800	[2] Piedmont	1,720
Alto	25	Gilroy	2,000	Pike City	200
Angel Island	280	Glen Ellen	500	Pinole	1,500
[5] Auburn	2,375	Gold Run	100	Pittsburg	2,372
Agua Caliente	100	[3] Grass Valley	4,500	Pleasanton	2,000
Alvarado	900	Gridley	1,800	Point San Pedro	20
Antioch	3,000	Groveland	125	Port Costa	600
[2] Barber	500	Guerneville	500	[2] Redwood City	3,200
[2] Belmont	350	Hammonton	500	[2] Richmond	10,000
Ben Lomond	800	[2] Hayward	4,000	Rio Vista	884
Belvedere	1,000	[2] Hillsborough	1,000	[5] Rocklin	1,000
Benicia	3,360	Hollister	3,000	[5] Roseville	2,600
[2] Beresford	25	Hookston	75	Rodeo	500
[2] Berkeley	40,000	Ignacio	100	[2] Ross	500
Biggs	750	Ione	900	[4] Sacramento	60,000
Big Oak Flat	20	Irvington	1,000	San Andreas	200
Brentwood	200	Jackson Gate	100	[2] San Anselmo	1,500
Broderick	200	Jackson	2,035	[2] San Bruno	1,500
Brown's Valley	50	Kennedy Flat	20	[2] San Carlos	100
Byron	200	[2] Kentfield	250	[2] San Francisco	416,912
[2] Burlingame	4,000	Knight's Landing	350	[2] San Jose	30,000
California City	25	Lake Francis	5	[2] San Leandro	4,000
Camp Meeker	200	Lathrop	300	San Lorenzo	100
Campbell	600	Live Oak	200	[2] San Mateo	6,500
Centerville	1,000	Livermore	2,250	[2] San Quentin	2,500
Centerville	20	Los Gatos	3,000	[2] San Rafael	6,000
[2] Chico	13,000	Larkspur	600	San Pablo	1,000
[2] Colma	3,500	Lincoln	1,400	Santa Clara	6,000
[2] Colusa	1,500	[2] Lomita Park	100	Santa Cruz	16,000
Concord	1,500	Los Altos	500	Saratoga	50
Cement	1,500	[5] Loomis	400	[2] Santa Rosa	12,000
[5] Colfax	500	Martinez	5,000	[2] Sebastopol	1,200
Cordelia	150	Martell	150	Sausalito	2,500
Corde Madero	350	[2] Marysville	7,000	Smartsville	500
Crockett	2,500	Mayfield	1,500	[2] South San Francisco	2.500
Crow's Landing	375	[2] Menlo Park	1,500	[2] Stanford University	2,600
Cupertino	50	Meridian	300	Sonoma	1.200
Daly City	250	[2] Millbrae	300	Stege	1,000
Danville	250	Milpitas	300	[5] Stockton	30.000
Davis	750	Mill Valley	2,500	Suisun	1.200
Decoto	350	Mission San Jose	500	Sutter City	150
de Sabla	25	Mokelumne Hill	150	Sutter Creek	1,500
[5] Dixon	1,000	Monte Rio	50	Sunnyvale	1,500
Dobbins	50	Moulton's Landing	30	Tiburon	400
Davenport	1,000	Mountain View	2,500	Tormey	20
Drytown	20	Mt. Eden	200	Towle	100
Durham	500	Mare Island	500	Tracy	1,200
Dutch Flat	500	[2] Napa	7,000	Vacaville	1,200
Duncan's Mills	150	[3] Nevada City	2,700	[2] Vallejo	15,000
[2] Easton	300	New Chicago	10	Walnut Crek	350
[2] East San Jose	1,660	Newark	700	Warm Springs	200
Eagle's Nest	50	[5] Newcastle	750	Watsonville	4,500
Edenvale	500	Newman	1,000	Wheatland	1,400
Eldridge	500	Niles	800	Winters	1,200
Elmira	150	Nicolaus	75	[2] Woodland	3,200
El Verano	400	Novato	250	Yolo	400
[2] Emeryville	5,000	[2] Oakland	230,000	[2] Yuba City	1.200
Encinal	100	Oakley	80		
Fairfax	500	[2] Palo Alto	6,300	Total	1,136,222

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⅗ the size of New York State.
½ the size of all the New England States combined.

PACIFIC GAS AND ELECTRIC MAGAZINE

Published Monthly by
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO

VOL. 4 OCTOBER, 1912 No. 5

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Pacific Gas and Electric Magazine

Vol. IV

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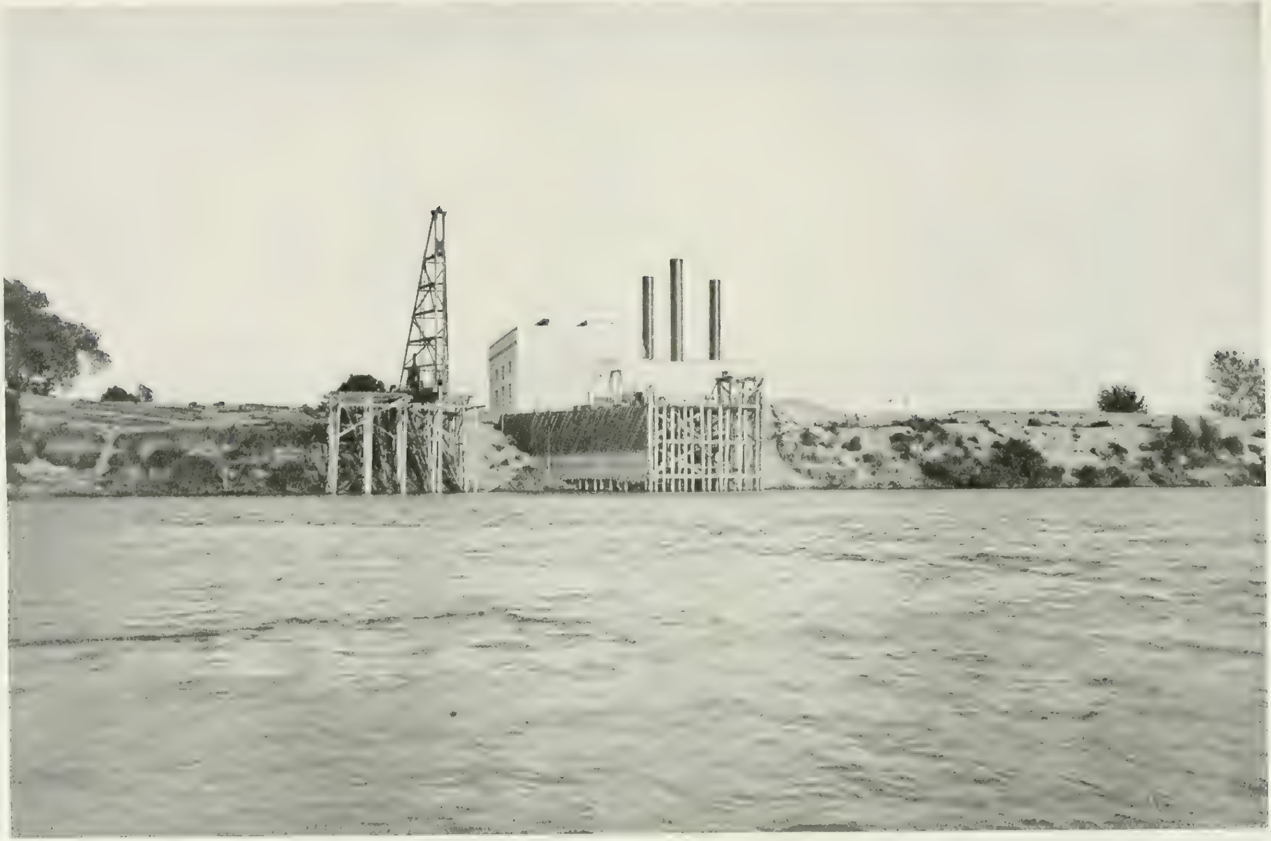


View from the river of our new steam-electric station at Sacramento. The photograph was taken in mid stream from the West Sacramento Company's fast launch "Netherlands"

PACIFIC GAS AND ELECTRIC MAGAZINE

VOL. IV OCTOBER, 1912 No. 5

Our New Steam-Electric Station at Sacramento

By PAUL E. MAGERSTADT, Superintendent of Construction.

Paul E. Magerstadt

The Sacramento River Station is a steam-turbine generating auxiliary to the Pacific Gas and Electric Company's hydro-electric system.

"Pacific Service" in power transmission, stands for absolute continuous service, and the new Sacramento River Station exemplifies to what extent the company is expending capital to make "Pacific Service" perfect service. Although the Sacramento District is connected with the transmission lines from the Colgate, Alta, and Folsom systems as well as the main transmission line to Oakland, this new plant has been constructed as an absolute safeguard and insurance against interruption of service.

With final installation to its full designed capacity, 12,500 kilowatts, this plant will be capable of carrying the full Sacramento District load. In normal operation a machine will be kept floating on line, using a minimum amount of steam, but with enough boilers under steam to respond instantly to emergency calls. Although designed as a standby, or auxiliary, the fact that all the hydro-electric stations are taxed to their full capacity will put the steam plant in constant commission as a generating station.

The station is ideally located near the east bank of the Sacramento River, about $\frac{1}{4}$ mile north of the Sacramento City limits, on a 4-acre tract of rich river bottom land. The surroundings are very pleasing—the combination of river, green alfalfa fields, and woods, making a beautiful setting for the building. The architectural treatment of the station is in perfect accord with the location. The building stands about 10 feet above the general ground level and is surrounded by a terrace upon which there will be a lawn. The levee adjoining the building has been trimmed to even slopes which will also be converted into lawns to be in keeping with the rest of the station.

The building has a structural steel frame, while the walls, floors, and roof are of reinforced concrete. It contains 350 tons of structural steel. This, although detailed and fabricated in record time, was delivered absolutely perfect and without a single misfit. Five hundred piles 35 feet long, driven to the depth of ground water level, (a condition necessary for preservation of the piling), support the structure. These piles under a loading test supported 35 tons each with less than $\frac{3}{16}$-inch deflection, thus an absolutely solid foundation is assured. The building is "L" shaped, having a total length of 156 feet, 5 inches, a width of 100 feet, 6 inches at the north or generating end and 71 feet, 4 inches at the south or boiler end of the building. The

The new station is architecturally beautiful

turbine room end of the building has three floor levels, the total height being over 70 feet above the first floor. The boiler room is one-story high, the height to roof being 40 feet above first floor level. The exterior finish of the building is at once simple but effective. Plain panels set off by heavy copings and cornices is the scheme of decoration employed. The finish is in plaster of white Santa Cruz Portland Cement, and is a fine example of careful and excellent workmanship.

The main entrance facing the river is rather elaborate. Two large double paneled oak doors, with concrete moulded casing, support an appropriate cartouche, the whole being backed by a large arched window heavily moulded. The plaster finish has been applied to three sides, the east wall being left blank to provide for the building extension which will probably be necessitated within a few years. The interior is simply finished with cement floors and skim coat of plastering on the walks.

The boiler room is large, well lighted and airy. The light is from above a glass covered monitor, or weatherhood. The hood and the louvres are of pressed metal, the glass is a heavy plate wire glass.

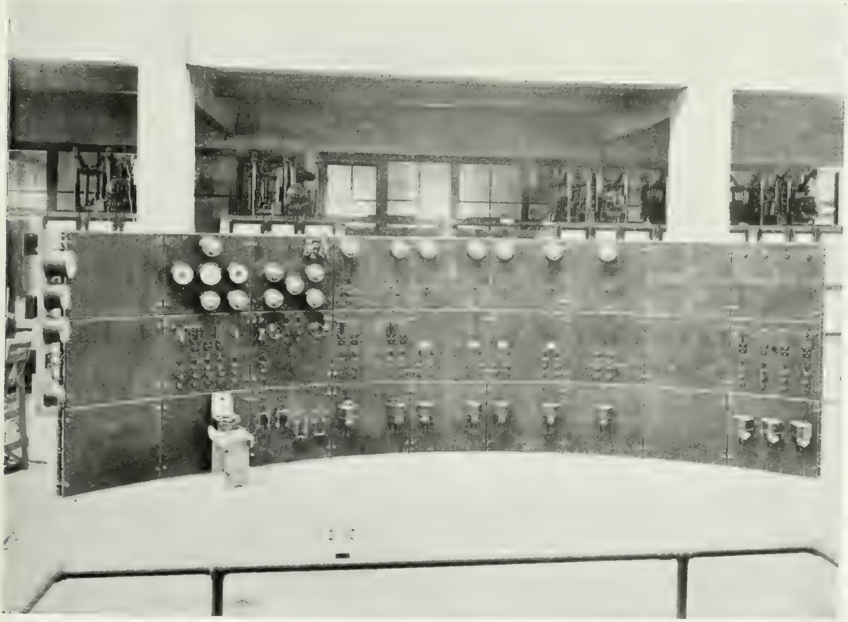
At the present installation, 3 batteries composed of two Stirling boilers each are in place. Provision has been made for an additional battery which will be installed when the second unit is placed. The boilers are of the water tube type, each containing 600 3¼-inch tubes, three 42-inch drums and one 18-inch mud drum. Each is rated at 822 boiler horsepower, making these boilers among the largest on the coast.

The high pressure steam pipes are designed for 200 pounds steam pressure with 125 degrees of superheat. Especial care was taken in the design of the piping arrangement to make all parts accessible and easy to get at for the purpose of operating, inspecting and repairs. In this respect some radical departures from common practice have been made, but they suit the local conditions admirably. The piping is extra heavy hydraulic, while all fittings and castings above 2-inch are of steel. The steam pipes are protected by a magnesia asbestos covering 3 inches thick. The arrangement of the piping is such as to make the steam distribution system perfectly flexible, so that it is possible to cut out any part, for inspection and repairs, without danger of interruption of service.

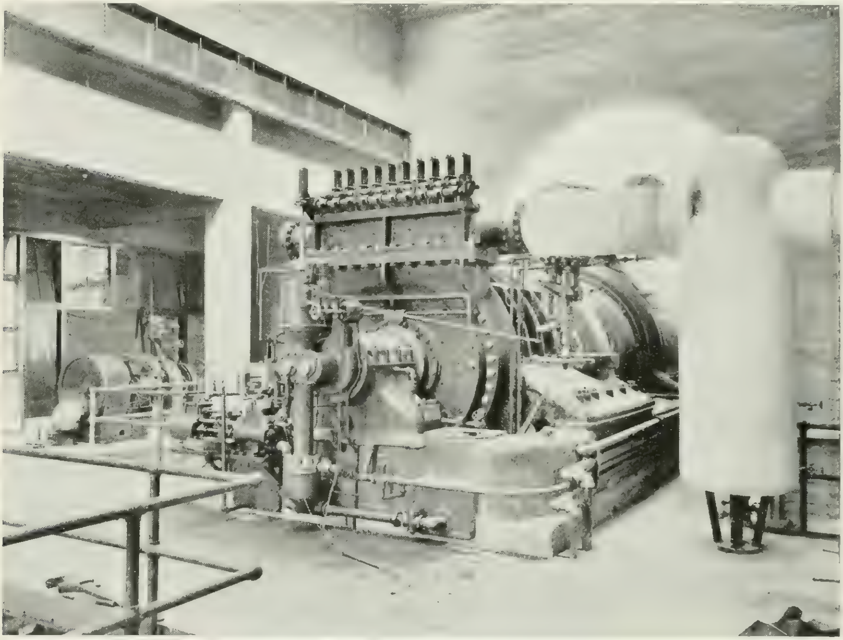
Each battery of boilers supports one smoke stack 7 feet, 6 inches in diameter mounted on breeching. These stacks stand 100 feet above the floor and 60 feet above the roof.

Fuel oil is, of course, the material used for firing. This is fed through Peabody back shot burners, three to each boiler. The fuel oil pumps are of the Worthington duplex type. Provision is made to carry a full month's supply of oil fuel. The storage tanks are placed on the extreme east end of the property, about 450 feet east of the building. These are two riveted steel tanks, the capacity of each being 10,000 barrels. The tanks are about 50 feet in diameter and 30 feet high. The tank walls and top are supported inside by timber bracing to prevent the tank collapsing when empty in a high wind. Each tank is supported on a reinforced concrete pad 30 inches deep and about 58 feet in diameter. A reinforced concrete retaining wall 12 feet high and 95 feet in diameter surrounds each tank. This is a safety precaution to hold the oil in case of a fire or of the tanks failing. The capacity of the concrete retainer is made equal to that of the tank.

The oil is brought to the tanks through 8-



The switchboard is of ebony-asbestos



The 5,000-kilowatt Curtis turbine installed

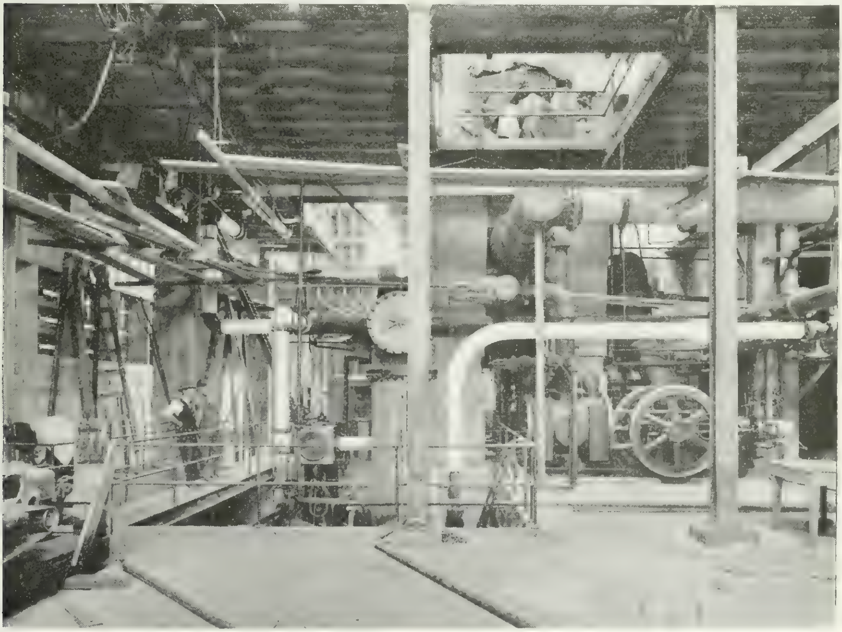
inch standard screw piping. Provision is made for the delivery of oil from barges on the river or from cars. On the pipe wharf there is an oil manifold with four 6-inch connections. Along the spur railroad which runs in front of the building is a car manifold with four 4-inch connections. The service oil is brought to the building through an 8-inch pipe encased in sawdust with a 2-inch steam line to heat the oil. Just outside the south end of the boiler room are two rectangular oil service tanks of 200 barrels capacity each. These are encased in reinforced concrete. They are placed below the ground level and are accessible through manholes.

The generating and auxiliary machinery is located on the first and second floors of the main bay adjoining the boiler room. The remaining bay is divided into three stories and contains the electrical equipment. The main bay which is 38 feet wide by 100 feet long, is traversed by a traveling crane of 40 ton capacity with an electrically operated hoist which greatly facilitated the placing of machinery. In unloading from the cars the facilities were not so good and it was often necessary to use the S. P. Railroad's wrecking derrick.

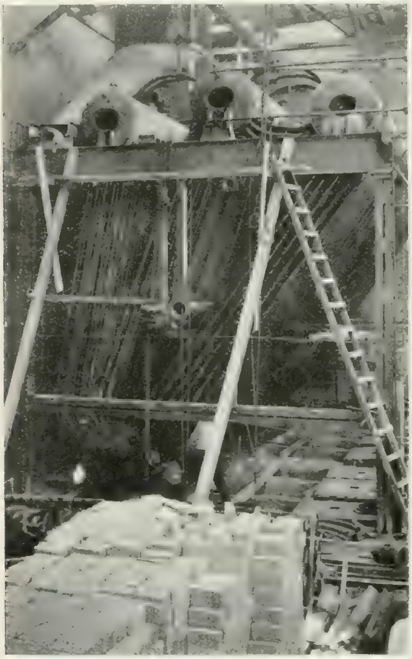
On the second floor level, toward the east end of the building, is located the first unit, a 5,000 kilowatt Curtis horizontal type, 5-stage turbo-generator, furnished by the General Electric Company. The turbine foundation consists of 6 heavy rectangular reinforced concrete piers. Directly below the turbine and supported from the main floor by steel columns is the condenser unit which is connected to the turbine by an expansion joint. The condenser is a large drum or cylinder containing nearly 3,000 1-inch brass tubes, 14 feet long, which gives a cooling surface of 10,000 square feet. On each end of the condenser are cylindrical water boxes. On the main floor under the generator is placed a 4-stage, 4-inch Alberger rotary pump direct connected to an Alberger Curtis steam turbine operating at 3,600 revolutions per minute. This unit will supply feed water to the boiler. A Dow duplex steam pump, with cylinders 9x16x7x12 inches, is installed nearby for the same purpose but will be used mainly as an auxiliary or standby. Under the condenser are two 4-inch hot well pumps. One of these is driven at 1,500 revolutions per minute by a Kerr steam turbine, while the other is motor driven by a 20-horsepower, 110-volt direct-current interpole motor. South of these are two Elliot feed water filters and the hot well tank. West of the turbine foundation is placed a Mullan vacuum pump with cylinder 9x16x17x12 inches.

In the center of the bay is a pit about 10 feet below the floor level in which are placed the circulating pump and engine. The engine is an American Ball compound. The pump is a 30-inch double feed centrifugal, made by Byron Jackson, direct-connected to the engine by flexible link coupling. The pump draws water from the river through a 36-inch cast iron pipe and forces it through the condenser, where it cools and condenses the exhaust steam, and passes back to the river through a similar 36-inch pipe.

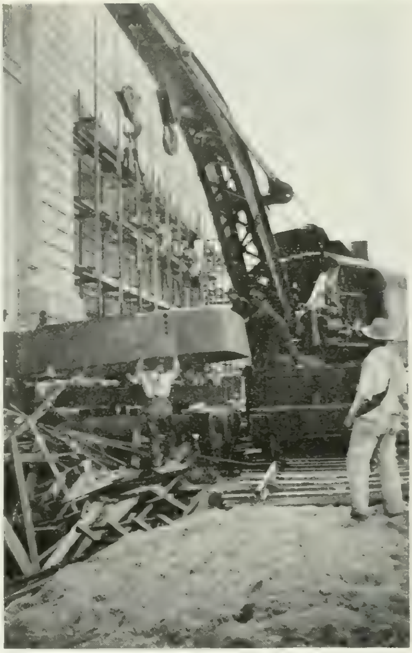
On account of the extreme fluctuation in the height of the Sacramento River, (over 25 feet), special provision had to be made for the intake and discharge piping. A wharf was constructed well out into the river, properly protected by a fender or spring line of piling. The top of the wharf is well above the high water level. The main intake pipe is horizontal and about 10 feet above the low water mark. At the end is a special tee joint which revolves in cast bearings. At the end



View of condenser and auxiliary apparatus (in course of construction)



Boilers No. 5 and No. 6, showing drums, tubes and stack breeching



Unloading turbine base

of the intake pipe is a strainer and foot valve. By means of a winch installed on the top of the wharf the pipe may be revolved to accommodate any depth of water or be raised clear for cleaning or inspecting. The discharge pipe is turned by means of elbows to discharge horiztonally at a point below the lowest low water and down-stream from the intake, so there will be no danger of getting hot water into the intake. The circulating water for both boilers and condensers is taken from the river as is also the boiler feed water. A well was put down in the event that the river water becomes two muddy for feed water. Two 5,000 gallon tanks are placed on the roof as part of the water supply system.

To the west of the circulating pump pit and adjoining the boiler room wall are two vertical feed water heaters. The rest of the space in this bay is reserved for the second unit which will be a 7,500 kilowatt machine, probably of the vertical type. On the north end of the first floor are seven 1,500 kilowatt General Electric Company's transformers with room for future installation of three additional. These are oil-immersed and water-cooled, wound for a voltage ratio of 31215-54,000 Y on the high tension side and 11,250-19,500 Y on the low tension side.

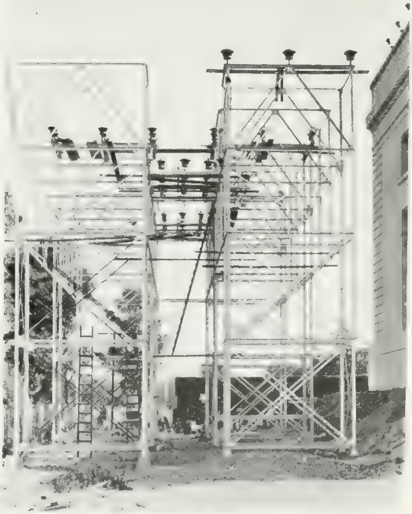
In front of the transformers are arranged a row of concrete cells which house the two 11,000-volt station bus lines, meter transformers, and disconnectors. The 11,000-volt circuit which is for local service is connected to the Sixth and H Street station through underground duct lines. A transformer compensator is located on the east end of this floor. This is a 5,000 kilowatt oil-immersed and water-cooled transformer which acts as a reactance in the generator circuit and also transforms from the 4,000-volt genertor current to 11,000 volts for paralleling into the bus lines.

The north end of the second floor has been partitioned off for offices, locker room, storeroom, lavatory, etc. Surrounding the unit and extending clear across the main bay is a steel operating platform with pipe guard rails. On this floor are set two exciters, one turbine driven exciter to the east and a motor driven exciter to the west of the switchboard which is in the center of the bay. This dual system of similar machines has been installed throughout wherever possible to insure absolute continuous service in any emergency. The steam-driven exciter is a six-pole, interpole 75-kilowatt, 125-volt, direct-connected generator driven at 3,300 revolutions per minute by a Curtis non-condensing steam turbine using steam at 175 pounds pressure. The other unit is a 100-kilowatt interpole direct-current, 125-volt generator driven through a rigid coupling by a Fort Wayne 150-horsepower, 3-phase, 220-volt induction motor at a speed of 870 revolutions per minute.

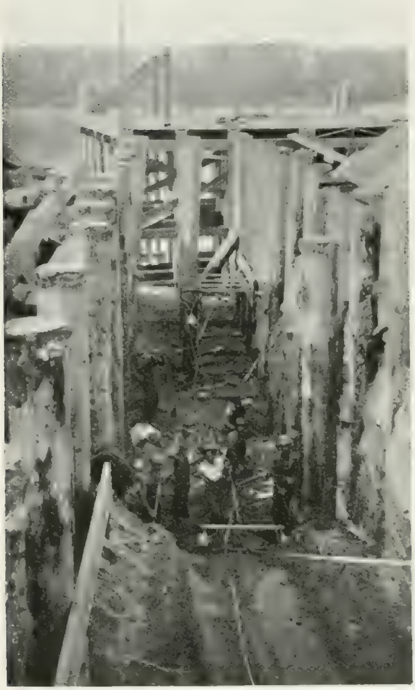
The switchboard is composed of 9 ebony asbestos panels arranged in the arc of a circle. The curved form permits an operator to have all instruments in view from any position, an efficient feature especially in case of emergencies. This board controls the two main generators, the exciters, four high tension circuits, and two local circuits. On this floor also is a double row of 12 cells containing 11,000-volt, type H3 General Electric motor operated circuit breakers. On the east end of this gallery is a switch cell containing two 4,000-volt, three-pole type H-3 circuit-breakers on the main generator leads, and near this is a concrete cell containing the disconnector and series and shunt transformers for supplying the generator switchboard instruments.

The third floor, or high tension room, is entirely enclosed. It contains the 60,000-volt oil circuit-breakers. In this room are six sets of three switches each. These are arranged in two parallel rows each having its own cell. The three high tension circuits from the circuit breaker to the transformer on

Erecting a steel tower


The 60-kilovolt switch tower

the first floor are led down through a metal lathed concreted chute having an inside clearance of 36 inches. A high tension bus with suspension type insulators is supported from the roof with disconnectors at the center point.



Excavating trench, with steam hoist and framing pipe supports for circulating water system

The 60,000-volt lines are brought from their circuit-breakers into a closed monitor from which the lines run horizontally through openings in double windows to Baum type, horizontal, two break rotary disconnecting switches mounted on a steel frame fastened to roof and operated from a rail guarded gallery on top of the monitor. From this point the lines run down to a switching tower arranged for receiving four transmission lines with sectionalizing disconnecting switches.

Running directly east from the station $1\frac{1}{2}$ miles of transmission tower line was built to tie the plant to the main transmission line at Twelfth Street. These are double circuit steel towers 78 feet high. They are built on the general lines of the tower adopted by the company for the 150 mile transmission line from Cordelia to the Bear River Plant which is in process of construction.

The station is now ready to operate. The various machines have all been tested out and the plant is prepared to carry a load at a moment's notice.

The man who insists upon seeing with perfect clearness before he decides, never decides. Accept life and you must accept regret.

What's In a Name?

Here is a new and original definition of "Pacific Service" in the form of an acrostic. Responsibility therefor rests upon the shoulders of the able and energetic Superintendent of Gas Distribution in San Francisco, who modestly seeks to conceal his identity under the initials D. E. K.

P Practical Knowledge

A An accommodating Spirit

C Control of Temper

I In the matter of promise, exercise extreme care

F Familiarize yourself with conditions

I In word and deed be gentlemanly with persistence and patience

C Courtesy

S Sincerity

E Enthusiasm

R Reliability

V Vim

I Initiative

C Courage

E Efficiency

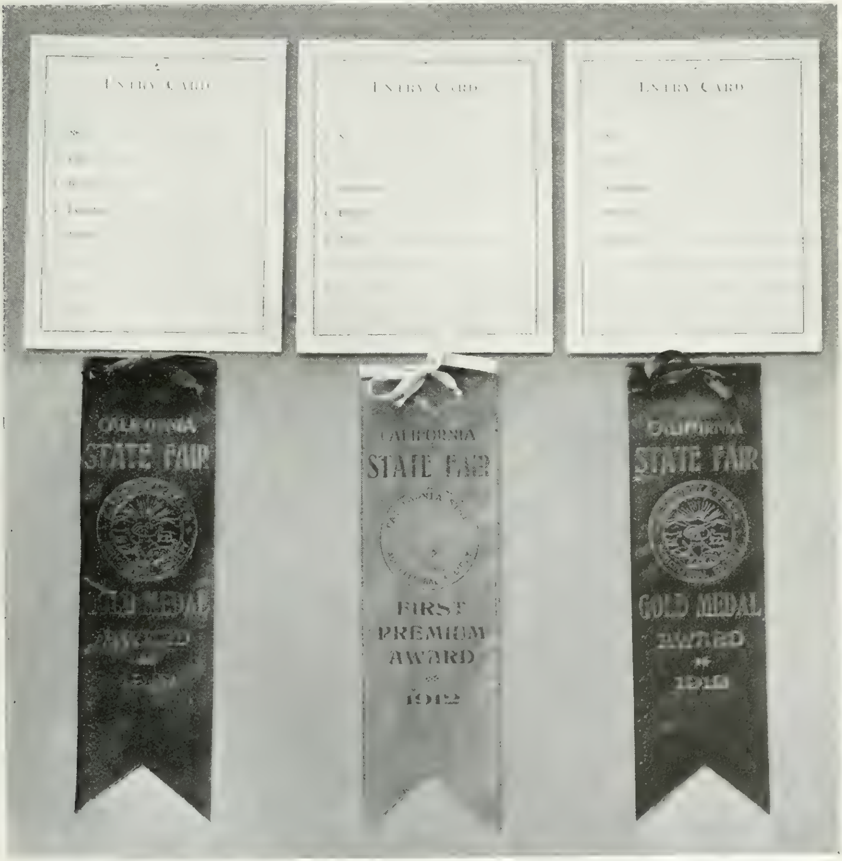
"Pacific Service" Won Glory at the State Fair

By E. A. WEYMOUTH, Commercial Department.

E. A. Weymouth

The Annual Fair of the California State Agricultural Society was held at Sacramento from September 14th to the 21st inclusive, and is credited as being the best ever held from almost every standpoint.

The permanent buildings in the grounds were greatly overtaxed or exhibit space and many tents large and small were necessary to house the several features. "Pacific Service" took an active part among the exhibitors and displayed its now famous Electrical Demonstration Car, a unique and interesting attraction. A point of vantage as regards situation favored us here. A spur track from the Central California Traction Company's line runs into the grounds and terminates along-



Honors for ''Pacific Service at the State Fair

Company's Booth, showing Electrical Demonstration Car

side Machinery Hall, closely adjoining the broad pathway from the main entrance. Here the car was placed, and as a protection to visitors from the sun and to keep the car as cool as possible, a large awning was stretched overhead with good effect.

The Demonstration car and its work have been described in previous numbers of this

Smiles despite the heat—"Pacific Service" Demonstrators magazine. To more clearly demonstrate the efficiency of pumping with Electric Power, however, a 4-inch centrifugal pump, with motor direct-connected, was installed on an elevated platform at one end of the car. A tank was concealed beneath the platform, and water was pumped from this into a combination weir and stilling box, the water then flowing through a flume and back again to the tank. The large flow of water through the pump, the silence of the motor and the compactness and small size of the equipment furnished a most vivid and effective contrast to pumping by means of other kinds of power. This demonstration attracted a great deal of attention, and many inquiries were received, which will undoubtedly result in new business for the company, besides making our exhibit really worth while.

A large "Pacific Service" sign ablaze with light by night pointed the way to our exhibit, and three 250-watt and one 150-watt Mazda lamps with reflectors lighted the entrance and exit of the car. The interest shown was most gratifying. Advertising literature pertaining to the many uses of Electricity was circulated by the thousands and at no time was it scattered abroad promiscuously. During the week about 90,000 people visited the Fair, and of this number it is estimated that 40,000 entered the demonstration car to see our exhibit. When it is borne in mind that ours was one of the separated displays within the grounds and not one of the many crowded in a large building, it is conservative to state that "Pacific Service" received more visitors, and attracted more attention than any other single exhibit.

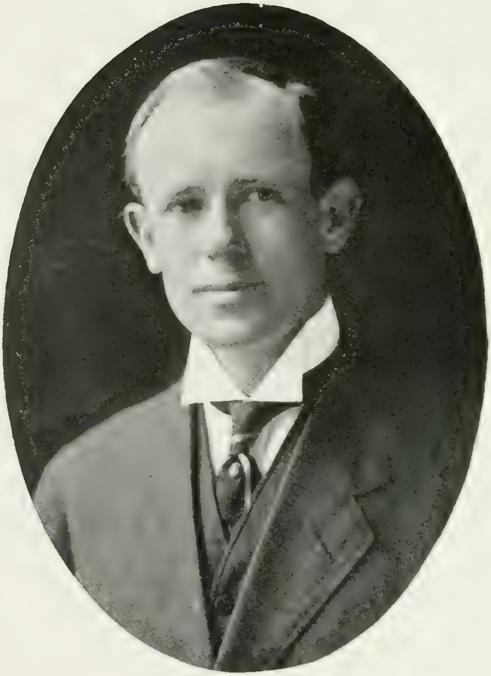
To crown our efforts we received three highest awards. A Gold Medal was awarded our demonstration car as an exhibit of special merit, exhibiting and demonstrating everything electrical for farm and home. A Gold Medal was awarded "Pacific Service" for having the best electric display for domestic purposes, such as fans, irons, cooking and heating stoves, etc. in operation. A First Premium award was ours for having the best exhibition of electrical appliances, consisting of dynamos, motors, arc and incandescent lighting, etc., used for exhibition only in operation. So "Pacific Service" won glory at the State Fair this year.

Some Changes Announced

From the President's office comes the announcement of the enlargement of the San Jose District, by the inclusion of the distribution system in and around Mountain View, and all territory between Mountain View and Madera Creek, this creek to form the northern boundary of the District. By the same order the Redwood District is compensated for the loss of a portion of its territory by the inclusion of all territory between Madera Creek and the San Francisco county line. This abolishes the South San Francisco District, and makes it a part of the Redwood District. The order is to take effect Nov. 1st.

Two Power Divisions have lost their Superintendents. C. E. Young of Marysville, has been transferred to the head office in San Francisco, and Joseph Mini of Colgate is sent to aid in the Drum Power House construction. Engineer Downing has appointed E. C. Johnson and Miles Werry superintendents of the Marysville and Colgate divisions, respectively.

Mr. W. V. Vincent, the Company's Valuation Engineer, has been appointed to take charge of the compilation of all physical data under the direction of the President's office.



JAMES H. WISE

Born February 27, 1880 Died September 16, 1912

A TRIBUTE

GRAVEN on the minds of people stand out the names of men and women who have contributed to literature or statesmanship, or whose deeds of heroism on the fields of battle have won for them the lasting renown that time strengthens rather than removes. Nations vie with nations in erecting monuments of marble or bronze to the famous dead of their country—that in ages to come they may be remembered and revered.

It is given to few to begin during their lives the erection of the monument which shall continually remind those who follow of the greatness of the one who so builded.

Up in the fastness of our wondrous Sierra Nevada Mountains, where the peaks of eternal snow thrust their points to touch the heavens, where the forest pines sigh nightly their requiems, where the flowers hide themselves in the protecting niches of the rocks, and the unpolluted streams flow silently onward to the sea, there where Nature rules in her grandest moods and all the world is nearer to God, there

James H. Wise

began the building of his monument, that so long as the eternal hills endure will be a lasting memorial to him as a man, as an engineer, and as a friend.

"His life was gentle; and the elements
So mix'd in him, that Nature might stand up
And say to all the world—This was a man."

Jim, dear lovable, loving Jim, of human mold with naught but words of cheer, of commendation, of consolation, of encouragement for all—Loyalty his creed—Strong of arm, quick of brain, soft of heart, filled with the fervid spirit of imagination, that soulful companion of the pure in heart—"He could not be spared"; but in the inscrutable wisdom of Him who doeth all things well he has gone and we are left, and in his going has left us an example of the way life should be lived.

It is given to few men to so live, that in the brief span of life a record is made so clean, so pure, so wholesome, as that of James H. Wise. A battling struggle with life from cradle to the grave—a devotion God-like in its attributes to his mother—An ambition to become an honor to her and to his country gratified—A name made for honesty, integrity, manliness, ability, and a morality that reached into his very fibre, and made him scorn uncleanness of every kind—He knew not the way to any subterfuge or color of untruth or deceit, his higher nature of knowledge of right and wrong made it impossible for him to swerve from that strictest path of the unquestioned road to right.

To those men young and old today in the service no better example exists, or will ever exist, of the proper path to tread along the roads that lead to success than the example of dear Jim, in his steadfastness of purpose to achieve by the only true way the good will of his fellowmen, by living the life of loyalty and fidelity and truth.

There will be days when his smiling face will come out of the darkness to bid us good cheer—days when his very presence will be felt by us and of us—for while materially he has gone on a trip "up the hill," spiritually he will ever be here to help and to aid in our work.

When the work on the hill is done, and the imprisoned waters dash through the solid rocks, and murmur over the canals, and plunge with mighty force to the river, and the invisible spirit of electric energy is gathered through the force of the water and sent on its mission of civilization, then will the memory of him who builded well find an everlasting monument in his completed work, finished by the loving minds, hearts and hands of those who deemed it an honor and a privilege to carry to successful completion the design of one whom they loved so well.

And so farewell and good-night till we meet again.

JOHN A. BRITTON.

OUR LEADERS

IT IS not often that a group of men working together to accomplish a great purpose has among its number more than one leader. And this is right, because in the general scheme of things some one must be the leader and others must follow, in order that the work, whatever it is, may be carried on without confusion.

We of the Company, however, are more than fortunate in that respect, because we have two leaders, and they are such successful leaders that there is not only no confusion, but the double leadership seems to strengthen the whole organization. Our biggest leader is known to us and the outside as our boss, or general manager, who, in his masterly way, directs everything, but whose duties are of necessity so multitudinous that he cannot come into direct personal contact with everyone in his organization. We who are so fortunate as to be in the city office, where we come in contact with him every day, are indeed favored, and I question if very many of us now realize how greatly we are benefited and helped by that personal contact.

Our other leader worked in the rank and file with us, but he was none the less a leader. He was personally known to every man, woman and child in our great organization, and to everyone he was an inspiration and a leader. One could not come in contact with Jim, feel his firm hand-clasp and be favored with his winning smile, without becoming a follower. There were no frills and no time for anything unpleasant, *but there was always time for a few pleasant words and a joke or two, that left not only a pleasant memory but something more tangible, something that gave new and better ideas. Jim was a leader, but not so much because his position made him one, but more, because his personality and his example were such that you could not help following him.*

He has been taken from our sight, but he can never be taken from our real selves, because he has made himself a part of us, and no matter what happens he will always be with us.

In going he has left two great monuments. The lesser one is made up of the great work he did while here. The greatest of these works he was only able to plan, but he has planned so well in the laying out of the work and the selection of the men who are to carry out the details, that the Drum Power Plant, when completed, will be one of the greatest engineering feats of the times. The other and greater monument is the influence he has had on the lives of those with whom he has come in contact, and they are many and of all stations in life. You could not come in contact with him, if only for a short time, without being a better man (or a better woman) for it, and this influence is bound to be handed down to your children and to your children's children for generations to come.

Jim Wise's time here with us was short, but his influence was so broad that his span of life, measured by its length and breath, was greater than that of most men.

S. V. WALTON.

JIM

Close to his lips the cup of life was pressed;
He had tasted but a portion of its wine;
Who shall censure, who the hand arrest,
That weaves our lives with intricate design?

"We could not spare him," and "we protest."
Yet shall we prove unworthy in the end;
By selfish grieving forfeit his bequest,
A lasting monument, the life work of our friend?

Let us be men! Are we afraid?
The trail is beaten, the work begun.
Not one shall falter, nor his hand be stayed;
His end must be gained, his work be done.

LURA B. WALTON.

Noting Progress of the World's Fair

The Panama-Pacific International Exposition will be ready on time. This is the positive assertion of its President, Charles C. Moore. After months spent on the preliminaries, the perfected plan has been adopted by the Board of Directors and orders have been given to go ahead immediately. For the first time in the history of International Expositions, the gates will swing open on time on a completed spectacle.

The positive order is that all exhibit palaces must be complete as though ready for occupancy on June 25th, 1914, which is nine months in advance of the date set for the opening, which is February 20th, 1915. All contracts will be let on that basis. The first great palace to be commenced will be that devoted to machinery. The contract for this will be let on or before November 11th. From then on contracts for the other great exhibit palaces will be let at the rate of two a month, and all of these great palaces must be in course of construction inside of nine months. It is estimated that ten months is the maximum limit of time necessary to complete the most elaborate of these.

At previous expositions the largest number of workmen employed at any one time was during the days immediately preceeding the opening, and in one noted instance the labor peak was not reached until after the exposition opened. In the case of the Panama-Pacific Exposition, this wil be entirely different. A large number of men will be given employment within ninety days, possibly 5,000, and this number will be gradually increased until the fall of 1913 when the work of construction will be at its very height.

Members of the Architectural Commission of the Panama-Pacific Exposition

Left to Right—Upper Row: Clarence R. Ward, Carl Bitter, A. Stirling Calder, Robert Farquhar, Henry Bacon, Louis C. Mullgardt, Jules Guerin.

Lower Row: H. D. H. Connick, Director of Works; W. C. Richardson, Wm. R. Mead, Geo. W. Kelham, Theodore Blake, Willis Polk, Arthur Brown, Jr., Clarence E. Howard, Edward H. Bennett, John McLaren and W. B. Faville.

As already announced the Exposition will occupy 625 acres on the northern shore of the city of San Francisco, with a water frontage of approximately two miles on the island-dotted bay with the Marin County hills and Mt. Tamalpais in the back ground. Hills on three sides form a gently sloping, natural amphitheatre which has lent itself to an architectural development calling forth the best efforts of America's foremost architects. These have planned an Exposition that strikes an entirely new note in architecture. Instead of planning buildings, they have arranged for six great courts, each of which, forming the walls of the buildings surrounding it, expresses the individual ideas of the architect who planned it, thereby being in complete harmony of design while entirely differentiated from all others. Standing in any one of these courts and looking northward, the visitor gets pictures of bay and mountains framed within the arches of these architectural triumphs.

Dredging on States' Sites on Presidio Reservation. A fill of over five feet has been made here

While the great exhibit palaces were being designed, those entrusted with the landscaping of the grounds, have not been idle. Hundreds of thousands of trees, shrubs, vines and flowers are ready to be removed at the proper time and set out in accord with a plan that will harmonize with the architectural and color scheme of the buildings. Vines will be set out on removable trellises, close alongside the exhibit palaces, so that when the support is removed they may be attached to the walls.

The filling in of 71 acres of Harbor View lands, has been completed by the San Francisco Bridge Company. The overflow lands that have been filled in cover that portion of the Exposition site bounded by the center line of Webster Street, the southerly line of Bay Street, the center line of Devisadero Street, the southerly line of Tonquin Street, the center line of Scott Street and the southerly line of Lewis Street.

This contract was let on March 25th and was completed within one hundred and eighty days. The contractors received no bonus, nor was their a penalty attached, and they showed their interest in the Exposition by speeding their work and completing it before the expiration of the time set for doing the task.

In making this fill 1,400,000 cubic yards of silt was pumped from the Bay on to the land; and in order to appreciate the vast amount of soil used in this work of filling in the overflow lands for a foundation to the Exhibit Palaces, which are to be erected on that portion of the Fair Site, engineers estimate that it would fill an area equivalent to Union Square to a heighth of 240 feet; which is practically as high as the Ferry Tower.

Borings for the foundations of the Exhibitions Palaces are about half completed. These borings were made to determine the quantity of the fill.

Wednesday, September 18th, was a gala day in the history of the Exposition to date. On this day the Imperial Japanese Commissioners formally selected a site for their country's exhibit. Japan holds place of honor as the first foreign nation to select a location for its building.

The dedication ceremonies were attended by a large concourse of people and were of an elaborate description. The Japanese Commissioners were entertained at luncheon by the Exposition Directors, and on the evening following the ceremonies they returned the compliment in a banquet that was voted the best thing of its kind ever given in San Francisco.

Mexico is expected to follow suit in very short order. In a letter to President Moore, following his visit to San Francisco recently, the Mexican Minister of Public Works expressed his desire to send a commission to San Francisco without delay.

As this number of the magazine goes to press Governor Judson Harmon and three commissioners from the State of Ohio are on the ground for the purpose of selecting a site for their State building.

Already fifteen foreign governments, including France and Japan have officially accepted the invitation of the President of the United States to participate, and thirty States and territories have appointed commissions to select sites for State buildings. Unofficial assurances have also been received from nearly a score of other Nations that they will be represented by exhibits.

That the counties of this State are planning to make a magnificent showing at the Panama-Pacific International Exposition is evidenced by the action of the Boards of Supervisors of 44 of the 58 counties, who have, by special tax levied this year, raised the sum of $555,435.00 for Exposition purposes.

The only Counties that have made no levy at any time for participation are Alpine, Modoc, Sierra, Del Norte, San Benito and Tulare.

The Flying Legion re-union in commemoration of the very successful trip to British Columbia was held in brilliant fashion at the opening of the present month. Five members of the Victoria Citizens' Committee, headed by Alderman Cuthbert and Randolph Stuart, set aside their personal affairs in the Northwest and came down to swell the gathering. They were made much of, and for one week there was a succession of lunches, dinners, drives and suppers. The banquet was held at the Fairmont Hotel on the evening of Wednesday, October 2d, each member of the brave band of one hundred who invaded British Columbia as Exposition Boosters being permitted to invite two guests. The whole affair was an unqualified success and the heartiest possible greeting was accorded the various speakers, including Mayor Rolph, Frederick J. Koster (Chairman of the Flying Legion), President Wheeler of the State University, Chaplain F. W. Clampett, Edgar D. Peixotto. Illuminated souvenirs of the occasion were presented to Mr. Stuart and Mayor Rolph.

Mr. W. L. Hathaway, who had more to do with getting up the Victoria trip than any one man, acted as host at several delightful affairs of a social order during the wek.

PERSONALS

Stanley V. Walton, Manager of our Commercial Department, left for the East September 28th on an extended trip. He will represent the Electric Development League at the Boston Electric show, will attend the Irrigation Congress at Salt Lake City, and will spend the best part of a month on a tour of inspection.

A. R. Thompson, Superintendent of Electric Distribution in San Francisco, is in faraway Delaware just now, visiting his home. He, too, will do some investigating, principally in New York and Chicago, to learn as much as he can about the latest methods of electric distribution.

W. F. Blide, Superintendent of the Valley District, is visiting his home in Chicago.

It is a fair guess that "Pacific Service" was well represented at the opening game of the series for the National Baseball Championship.

An event which found its way into the society columns of the newspapers was the marriage of Wm. Sydney Ward, operator at Station "J," San Francisco, to Mrs. Carrie T. Adams of Oakland. Ward comes from an old family in England, and has only been in California about a year. His bride is the daughter of the late Dr. J. S. Adams of Oakland, a lineal descendant of John Quincy Adams. Congratulations are in order.

We are all glad to congratulate T. R. Spear, the well known operator of Station "C," San Francisco, on the visit of the stork to his home on August 10th, presenting him with a fine ten-pound boy.

A ten pound daughter arrived at the home of H. E. Jones, Secretary to Geo. C. Holberton, on September 25th. Mr. Jones' birthday also falls on the 25th of September.

Among the many tributes paid to the memory of poor Jim Wise, one worthy of especial mention is from Edward F. Cahill, the well known editorial writer. In the San Francisco "Call," under date of September 22nd, Mr. Cahill has this to say:

"He was, if I may be permitted to say, one of my boys, having been the central figure of a group of splendid young men that used to gather at my home in their college days. Mostly they were graduates of the engineering school at the University of California, and they have all made good. Jimmy Wise was a natural leader of men, and before he reached the prime of manhood he had achieved a great position as engineer in charge of the most important and largest hydraulic project in America."

In addition to those printed in this number, contributions in memoriam were received from Chas. F. Walsh, of the Auditing Department, and Taraknath Das, A. M. Camp Drum. Unfortunately want of space prohibits their insertion at this time.

We have to apologize for two typographical errors in the September number of the Magazine. In one place we were made to say that an expenditure authorizing $30,-000,000 had been authorized to cover the re-construction of lines in the Woodland District. The amount really authorized was $30,000. Elsewhere there appeared a statement that the equipment of the new Sacramento River Station will consist of a 500-Kilowatt Turbine Generator, etc. Of course this should have read 5,000-kilowatt.

These errors probably did not deceive any of our readers who are familiar with installations and their cost. But to avoid any possible misunderstanding we hasten to make the necessary corrections.

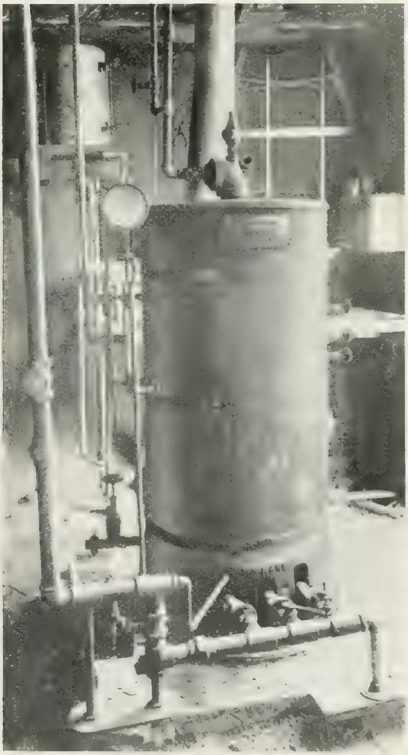
Test of a Kane Gas Boiler

By E. F. HAWLEY, Appliance Department, San Jose District.

E. F. Hawley

The accompanying photograph shows an installation of a 7 horsepower gas fired steam boiler in a laundry, displacing a 15 horsepower old type horizontal boiler.

The proprietor had tried other fuel and burners, including a set of large gas-burners placed in the fire-box of the old boiler, but no device proved entirely satisfactory. He was rather reluctant to try this gas-boiler as he was sceptical as to cost of operation and efficiency, but finally he allowed us to place it on trial.



The first three days the new installation was given a thorough test by running to the maximum use for all the laundry appliances, with the following results:

The boiler was filled with twelve gallons of cold water and brought to the steaming point within eight minutes; twenty-five pounds of steam, in twenty-three minutes; and fifty pounds of steam in thirty minutes.

The boiler is equipped with an automatic gas-regulator, and was tested with and without this regulator in operation. On a twelve hours run, holding steam at fifty pounds without regulator showed consumption of 3,300 feet of gas. The same time with regulator, showed a consumption of 1,700 feet.

After the steam has been raised to fifty pounds, it can be held at that point with one section of the burner at a consumption of 150 feet per hour, as the regulator will not open until steam is below thirty pounds.

Mr. Wagner, the proprietor, was greatly pleased with the results shown, as the boiler needs very little attention and saves the wages of a fireman.

Roderick—"Great Scott! Has Bilkins lost his mind?"

Van Albert—"I don't think so. Why?"

Roderick—"Just look at the illumination in his house. He has had every gas jet burning all day long."

Van Albert—"Oh that's just a little scheme Bilkins has to increase his gas bill this month. His wife is coming back tomorrow, and he told her he had ben remaining at home and reading every night since she went away. If she looked at the gas bill and found it to be only $3 he would be cornered for an explanation."

Gas Men of the Pacific Coast in Convention at San Diego

By E. C. JONES.

E. C. Jones

The 20th Annual Convention of the Pacific Coast Gas Association was held at San Diego on the 17th, 18th and 19th of September. It is customary to say of such gatherings that each, in turn, was the best ever held, but in the writer's opinion the statement that this convention was the most successful in the history of the Association may be made freely and without incurring the charge of exaggeration.

The papers were all vitally interesting and were ably and exhaustively discussed, while the splendid entertainment furnished by our host, The San Diego Consolidated Gas & Electric Co. left nothing to be desired. The convention was opened with an address by the President, Mr. Wm. Baurhyte, in which he discussed subjects of interest to all gas men, and showed his appreciation of the valuable work accomplished by the Pacific Coast Gas Association by recommending that in future the meeting days be extended by having three days of business session instead of two.

A live topic was touched upon by Mr. F. S. Wade in his paper entitled, "The Calorific Value of Oil Gas," dealing with the common sense attitude of some of the regulating bodies in adopting a heat unit standard for gas in place of the obsolete candle power standard. In this connection San Diego, the place of meeting, was one of the first municipalities to adopt the heat unit standard for gas.

The commercial side of the gas business seems to be the subject of considerable thought among gas men just now, and papers upon the subject of how to sell gas excite more discussion than do papers on how to make gas. Papers on the subjects of extending the business, the sale of gas for new and industrial purposes, and the proper service to be rendered the consumer were read by four wide-awake members. These included:

"Commercial Gas Illumination," by W. T. Pease.

"Sale of Gas Appliances by a Small Company," by F. A. Cressey, Jr.

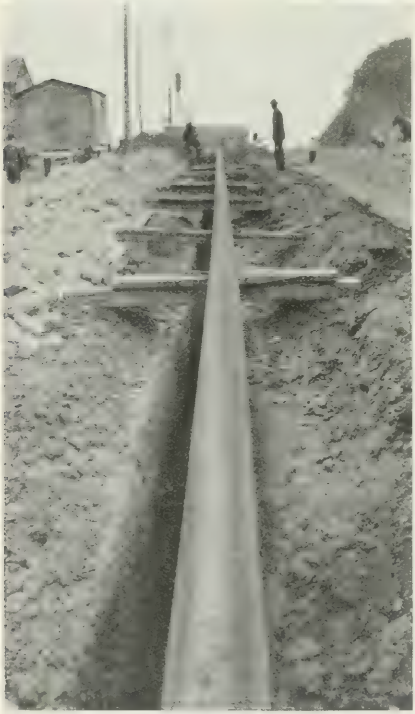
"Should Gas Companies Engage in the Sale of Gas Appliances," by L. H. Newbert and H. P. Pitts.

These papers were all up to date and full of interesting and instructive suggestions. They seemed to tap the line of thought of

Welding an eight-inch steel pipe

Gas Men at th

From left to right, Standing: T. F. Leary, J. C. Poingdestre, R. E. Van der Nailen, H. C. Keyes, C. H. Hu
R. H. Burdick, L. M. Klauber, E. Horst, D. Ray, W. H. Kline, S. Wood, J. D. Kuster, W. M. Kapus, B. S.
Sitting: F. C. Milliard, R. E. Matteson, F. C. Packer, R. L. Cardiff, R. O. Davis, J. E. Kelly, J. A. Galli, I. Benja
P. Haugh, C. S. Vance, Geo. Collins, H. Adams, Wm. Baurhyte, F. A. Leach, C. L. Cory, J. Werry, E. C.
J. Stevens, Wm. A. Davidson, W. Allquire, H. Leight, W. Armstrong, P. Wickersham, J. Davidson, B. H. Da



An eight-inch welded line ready to be lowered into the trench

every member present, and the discussions of them alone could easily have occupied the two days allotted the business part of the convention.

Judging from the discussion it seemed to be the consensus of opinion that gas companies should engage in the sale of gas appliances and that perfect service in the gas business should include the installation and subsequent care and oversight of all appliances for consuming gas.

The gold medal paper of the association was read by Prof. C. L. Cory of the University of California on the subject of "Reasonable Gas Rates and Their Determination." The paper discussed the subject from a middle ground between the public and the gas companies with equal fairness to both, and it was considered of such value by the association that it was ordered printed in pamphlet form for distribution among the members prior to its regular publication in the proceedings of the association.

Prof. Robt. Sibley of the University of California, who has devoted much time and thought to the crystallization of the association's fondest hope of having a course in gas

Convention

Parsons, T. E. Protheror, J. B. Redd, C. B. Cross, L. B. Jones, J. J. Portley, C. B. Babcock, R. L. Clark,
. J. Thompson, W. M. Henderson, F. R. Smith, F. H. Charles, F. S. Wade, W. T. Pease, R. J. Cantrell.
Amiral, R. Schwarz, L. Hartsock, E. Kelley, A. R. Gettings, T. Henning, Squires H. Pitts, R. Sibley, F. J. Shaffer,
Florence, O. E. Clark, S. Grover, F. C. Jones, A. J. Lloyd, J. Schalenberger, E. Grant, A. Childs, T. Robertson,
khardt.

engineering at the University, presented a scholarly and complete paper on the "Present Status of Gas Engineering in American Universities and Some Suggestions for a Specialized Course on the Pacific Coast." For many years the association has had in mind the founding of such a gas engineering course, and a committee on Gas Engineer's Degree has struggled with the problem from year to year until now, thanks to the generous financial help of the members of the association, a fund has been established which amounts to $2,700.00 per year for a period of five years.

Prof. Sibley's paper told us what they are doing in other schools and suggested a university course which will fit a man to enter the gas business and successfully cope with the business and make the gas business better by his advent.

The subject of Fire Brick for use in Oil Gas generators is of first importance, and this was ably treated by Mr. D. J. Young in a paper entitled, "Quality of Fire Bricks for Use in Oil Gas Machines." Owing to lack of time this valuable paper did not receive the discussion which it deserved, but it will be read with interest and profit when published.

Welding a joint in the trench

One of the most interesting practical papers was read by Mr. L. B. Jones on the subject of "Welding of High Pressure Pipe Lines." This paper dealt with a new subject to gas men and described the installation of an 8-inch high pressure gas main in which the lengths of pipe were welded together by the oxy-acetylene torch, making a line of pipe about a mile long without joints. The practical application of this method was demonstrated on the spot by the welding of two pieces of 8-inch tubing and by the cutting of a hole in the tubing by means of a torch and the filling up of the hole leaving a boss on the outside of the pipe, using the torch and a rod of Norway iron for doing the work. It was shown also how a service pipe might be welded directly into the main, although in practice this might not be considered advisable. This paper was fully discussed and seemed to be particularly interesting at this time as pointing to an ideal method of joining high pressure pipes without the use of rubber gaskets, which have been the cause of so much trouble.

The Wrinkle Department was ably handled by Mr. F. C. Millard, and the experiences were furnished by Mr. Wallace H. Foster. The Novelty Department in charge of Mr. R. L. Clark of San Diego was one of the most interesting features of the meeting and was the result of patient and untiring work on the part of Mr. Clark, with the generous assistance of the various manufacturers of gas appliances. The exhibit included almost every appliance for using gas for light, heat and cooking, and there were also exhibits of meters, pyrometers and other instruments.

The association held its usual banquet on the evening of Wednesday, September 18th, at the U. S. Grant Hotel. It was a good dinner. The menu was carefully selected and

An Example of Commercial Gas Illumination as provided by "Pacific Service"
The Globe Theatre in the Mission, San Francisco

served in a manner to uphold the reputation of the chef of this splendid hotel. Among the speakers of the evening were the Hon. John U. Eshleman, president of the Railroad Commission of the State of California; Col. Collier, president of the San Diego Exposition Company; Prof. C. L. Cory; Acting Mayor Dodson, and Dr. R. M. Powers, an old and esteemed member of the association who was unanimously elected an honorary member by a vote taken at the banquet.

Mr. L. P. Lowe responded to the toast "The Future of the Gas Business."

This garden spot of the south, with its perfect climate, and the atmosphere of romance which surrounds it, particularly lends itself to the having of a good time, and with the generous assistance of our host the members were delightfully entertained. Automobile trips, including visits to La Jolla, the marriage place of Ramona, the old San Diego Mission, and Tia Juana in Old Mexico were provided for the members and their ladies. There was a theater party at the new Spreckels Theater for the entertainment of the ladies, while the members were enjoying the banquet, and on the final day of the meeting after a delightful luncheon provided by the San Diego Consolidated Gas & Electric Co. the party enjoyed a steamer trip around the Bay of San Diego as the guest of the United Light Fuel & Power Co.

Much credit is due the committee in charge of the entertainment of the ladies and to the charming ladies of San Diego who assisted so heartily in dispensing hospitality. One item of the entertainment must not be overlooked. The automobiles used for the various outings were provided by business men of the city of San Diego gratuitously, and in most cases were driven by the owners themselves. In all there were sixty-five machines furnished. This is an eloquent tribute to the love which all San Diegans bear to their beautiful city and their willingness to work for its advancement. It's the "Get Together" spirit.

* * *

The attention of all employees of "Pacific Service" is called to the following recommendations concerning the use of the telephone, sent out from the Property Agent's office:

"Telephone operators in all offices where we have a regular telephone exchange, and also those employees whose duty it is to answer telephones coming in to district offices, should in all cases, when responding to a telephone call, answer the phone 'Gas Company' or 'Water Company,' as the case may be. Do not answer 'Hello' or 'Who is it,' but state immediately whom you are representing, as above.

"All persons throughout the entire system who have occasion to use the telephone in any way whatever, if answering the telephone personally, should answer as follows: 'Mr. Brown speaking', or 'Miss Smith speaking,' giving the name immediately, in order that the party calling may know at once that the party wanted is on the line.

"Employees answering telephones for departments should, upon taking down the telephone receiver, announce the name of such department, as, 'Electric Distribution Department,' 'Gas Distribution Department,' or whatever the department may be. Employees answering the telephone in behalf of Heads of Departments should answer by giving the name of the head of such department, for example—'Mr. Brown's office,' or 'Mr. Smith's office,' as the case may be.

"If this system is followed out, it will work a saving in time, not only to the party calling our Company offices and departments, but also to the parties answering such calls. In this connection, as a general rule, all employees should be instructed that prior to carrying on any conversation over the telephone in connection with company business, their first mission is to ascertain to whom they are speaking."

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PUBLISHED IN THE INTEREST OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

VOL. IV OCTOBER, 1912 No. 5

EDITORIAL

AMONG THE FEATURES OF THE RECENT most successful gathering of Gas Men of the Pacific Coast at San Diego, a paper read by Professor C. L. Cory of the University of California demands more than a passing notice from every person interested in the public service problem.

Under the head of "Reasonable Gas Rates and their Determination," Professor Cory delivered a most able address upon a topic that is of world-wide discussion at the present time. To quote Mr. E. C. Jones in his article upon the proceedings of the convention: "The paper discussed the subject from a middle ground between the public and the gas companies with equal fairness to both." This paper was considered of such value by the Association that it was ordered printed in pamphlet form for distribution among the members.

Volumes have been written on this rate question, and in his discussion of it Professor Cory, naturally enough, was compelled to travel over a great deal of old ground. But there was new matter in his discourse, and that new matter helped to make the whole of exceptional value to the body politic at a time when there is much agitation abroad in the land.

Professor Cory opened with the fundamental proposition that the rates charged by the public utility company must not be greater than the service is worth to the customer, and, at the same time, must not be less than sufficient to yield a fair or reasonable return to such public utility company. He regarded the quality of the service rendered as a matter of vital importance and dwelt upon the mutual responsibility of gas manufacturer and user. In this latter connection he urged for the gas companies a point insisted upon by the National Electric Light Men at Seattle in June, namely, that the public service corporation is best operated as a monopoly, a properly regulated monopoly, if you will, but a monopoly just the same. To quote Professor Cory:

"How can a company, individual, or any kind of an organization properly and satisfactorily furnish any kind of public utility service, constantly extending its system and increasing its investment co-incident with the rapid increase of population, if no protection is given it from what are really destructive 'shoe string' competitors or even competitors of the most powerful but piratical character?"

But the most important part of Professor Cory's paper came under the sub-heading, "Rates of Return and Values." Professor Cory dwelt upon the subject of risk as an item of consideration in the determination of a fair return on the capital invested. To quote:

"It has sometimes been asserted that there is practically no risk either on the part of the loaner of capital or on the part of the owner who used the capital to build and operate a public utility. However, there are few utilities that are operated without risk. Twenty odd years ago gas lighting companies seemed to be safe against losses, but electric lighting has been developed to such a degree that many gas companies are not earning bare interest rates on the cost of their property. There is, in fact, no plant on earth that is safe from possible loss of earning power, so long as inventive genius exists and continues active; for a new invention may, at any moment, change completely an entire industry."

Among the risks to which a public utility may be subject in a small town or city, Professor Cory enumerated: competition from other utilities, whether privately or publicly owned; stagnation in the growth of a town or city, causing loss of return on a plant built to provide for, and assist in, effecting growth; the passing of laws and ordinances injurious to existing business; financial panics that deprive people of the means with which to pay for ordinary utility service; fires, floods, and other disasters; regrading of streets and other public expenditures, the burden of which the utility company must share either through direct assessment or through taxation.

Professor Cory expressed the opinion that the term "Value" of any enterprise of any character must include, in addition to the physical property actually used and useful in rendering service, the going value or the value of the going concern. This the professor described as: "The difference between the value of a physically complete and practically perfect plant or system ready for operation but not in operation, ready to give service but not giving service, ready to earn an income, but actually earning no income whatever, ready to enter into long or short term contracts with customers or consumers, but actually having no contract of any kind with any consumers, at the end of the construction period but as yet with no business at all, and the value of this plant at some later time when business has been developed and perhaps firmly and permanently established with many contracts, some for long terms and of greater or less value, with customers connected and receiving and paying for service, possibly in a progressive territory where the enterprise in question has in the past assisted, and is at present assisting materially in the general advancement of the community."

An element of going value which Professor Cory regards as generally accepted is "development expense." He gave the following items as properly included therein:

1. The difference, if any, between a "fair return" on the "value" of the property during the first years of its existence, or during the development period, and the actual return, tabulated by years and until such time as it may be said that the business is established to such a degree as to be earning a fair return on the investment, including the interest which the business has failed to earn, taking each year by itself.

2. All actual costs directly related to the securing of business such as advertising, soliciting, unremunerative concessions to prospective customers, such as gifts, selling accessories below cost, maintenance of amusement parks to increase business, providing, of course, such costs are bona fide expenses over and above the direct revenue which may be obtained therefrom.

3. The cost of developing a competent business organization for the purpose of developing business, but this cost must not also be included in the general annual cost of maintenance and operation.

4. All the expense in the past history of the company which has been necessary and unavoidable in modifying the character of the system as a result of rapid changes in the art or abnormal growth of demand for service and which were required for the most economical operation and growth of the business, unless all such expense has been previously taken care of by an annual allowance for depreciation, obsolescence and inadequacy resulting from such modifications of the system.

Professor Cory concluded his remarks on this point with the following: "Necessary expenditures to develop business bear identically the same relation to the development period as interest during construction bears to the construction period."

This very valuable paper closed with a practical illustration of the principles governing the determination of gas rates. Professor Cory took a supposititious company, and gave figures showing how he arrived at the value of the system, determination of the investment, cost of operation and maintenance, taxes and depreciation, everything, in fact, which would go to make up a mathematically correct calculation of all that is required to be considered in arriving at a determination of the rates to be charged by a public service corporation.

When Professor Cory's paper appears in pamphlet form it will be well worth every citizen's while to give it most careful study. It will bear close analysis.

"Pacific Service" to Form Company Section of the N. E. L. A.

By HENRY BOSTWICK.

Henry Bostwick

Mr. Harrington Emerson, in the course of an address recently delivered at Boston, Mass., on "Educational Demands of Modern Progress," remarked:

"Time is also a river. It also has its lakes, its rapids, and its issuance into a limitless ocean.

"We, voyagers down the river, are now already in the stormy channel between two epochs. As never before in the history of the world has past knowledge, past experience, past skill, counted for so little, and never before in the history of the world have men been so poorly prepared for what was ahead of them."

The above quotation is tersely and truly put, and it is to prepare men for just such emergencies that the National Electric Light Association and other kindred societies have been organized.

At the 35th Convention of the Association, held this year at Seattle, Wash., we of the Pacific Coast realized that the National Electric Light Association has become a potent factor in the development of our industry, and because of this a movement has been started for the formation of a Pacific Gas and Electric Company section of the Association, as outlined in a general letter addressed by Mr. Britton to those of our employees who are Class "B" members. The letter follows:

October 1, 1912.

To the Employees of the Pacific Gas and Electric Company, Class "B" members of the National Electric Light Association.

Gentlemen:

For your information I beg to advise that application having been made to the National Electric Light Association for permission to form a "Pacific Gas and Electric Company Section" of such association, and such permission having been granted, steps are about to be taken looking toward the organization of such "Company Section."

At present there are seventy-five employees of the Pacific Gas and Electric Company enrolled on the books of the National Electric Light Association as Class "B" members; and with this number as a foundation, which I am sure will be largely supplemented when all of our employees realize the great advantages to be gained from an educational point of view by their co-operation with the "Company Section," the success of the "Company Section" is at once assured.

When the "Company Section" has been finally launched it will be our aim to arrange to have at least one meeting a month, and this action on our part cannot help but develop an *esprit de corps* as between our employees, and will also have a tendency to bring "Pacific Service" up to the highest point of efficiency, which should be the constant aim of all our employees.

Furthermore, as provided for in the Constitution and By-Laws of the National Electric Light Association, the object of the "Pacific Gas and Electric Light Section" shall be:

"To foster and promote the common interests of its members through intercourse and association, and to advance by the preparation and discussion of papers a scientific, commercial and practical knowledge of all matters pertaining to the generation, distribution and sale of electricity."

In order to be associated with the "Company Section," it is necessary that the employees be Class "B" members of the National Electric Light Association in good standing; and we would be glad to receive from all such employees an expression as to whether or not they will lend their hearty co-operation with a view of attaining the above results.

A prompt reply to this letter is respectfully requested.

Yours very truly,
John A. Britton,
Vice-President and General Manager.

For the general information of those who are not fully conversant with the affairs of the Association it may be of interest to state that the membership in June last was 12,084, of which membership 9,725 were Class "B" members; and there are also organized at the present time 37 "Company Sections."

As the purposes and aims of the "Company Section" are fully set forth in the above letter, I may state at this time for the benefit of such of our employees who might desire to become interested in the Association, as well as in the proposed "Company Section," that the annual dues for Class "B" members are $5.00, and that the Pacific Gas and Electric Company will gladly at this or any future time meet the first year's dues of any of its employees who are desirous of taking advantage of the opportunities which will be presented to them by their becoming members of the National Electric Light Association.

There are no lines drawn in the National Electric Light Association. It is for the general upbuilding of the industry as a whole and in all its branches, taking in the generation and distribution of electricity, commercial accounting, and all other departments; and it will be the purpose of the "Company Section" to bring out at our monthly meetings papers and discussions which will be of educational value to all of our employees and tend to bring them in closer touch with one another insofar as their respective duties are concerned. Thereby may we be better enabled to help one another in the problems of the day.

Should any further information be desired as to the National Electric Light Association, or the "Pacific Gas and Electric Company Section," I will gladly furnish same upon request, as well as application blanks for the use of such of our employees who may desire to avail themselves of this privilege.

In the November issue of the Magazine, which will be the official organ of the "Pacific Gas and Electric Company Section," a list of the charter members will be published, as well as of the officers who will have been elected at our first meeting, the date of which all employees who are now Class "B" members of the Association will be duly advised.

Courtesy as an asset in the success of a business man cannot be under-estimated. It makes for loyalty among employees, it attracts trade, it generates respect and good will. It is one of the principles of scientific management in shop, factory or store, and the higher the quality of courtesy extended the greater will be the reward from those who are the recipients of it.

ITEMS OF GENERAL INTEREST

The following important announcement was sent out from the President's office October 8th:

"Effectively immediately, Mr. F. G. Baum is hereby appointed Chief Engineer of the Hydro-Electric Department of this company, and as such will have entire charge and supervision over the construction of the Lake Spaulding, Bear River and Drum Power House developments."

This is welcome news, indeed, to all who are interested in the affairs of the Pacific Gas and Electric Company. Mr. Baum is an engineer who has made for himself an internatioal reputation, while still young in years, and not only is he the author of a standard work upon transformers but he ranks as the first electrical engineer to have solved the problem of the synchronizing or parallel operation of a series of power houses in one comprehensive system. He is recognized by the engineering fraternity as a deep thinker, a delver into engineering problems with a whole souled application that has resulted already in some very valuable additions to practical electric science.

Mr. Baum is peculiarly fitted for the work which he is now undertaking. Six years ago, when in the service of our company, during the course of a ramble through the territory covered by "Pacific Service" he discovered the Lake Spaulding dam site. His keen perception took in the lay of the land and at a glance he saw the opportunity for a great storage reservoir at the spot where the operations are now in progress, and, also, the great power possibilities that would attend the construction of a lofty dam in this narrow gorge that is the present outlet of the waters from the lake. Our deeply lamented Jim Wise received a great part of his practical education from Mr. Baum, and nothing could be more fitting than that he who was Wise's mentor for many years should complete the work so brilliantly commenced and so abruptly, alas, laid down.

The thirty-third convention of the Association of Edison Illuminating Companies, held this year at Virginia Hot Springs, was attended by our Mr. Geo. C. Holberton, who in addition to delivering an address on hydroelectric developments in California, had the honor of being elected Secretary of the Association.

The convention was held September 9th to the 13th inclusive. It was well attended and was successful in bringing out a great deal of valuable discussion. Mr. Holberton's talk contained particular reference to the application of electricity to reclamation and irrigation work. It was illustrated by lantern slides, and all present enjoyed it thoroughly, including the ladies, to admit of whose presence the event was held in the evening. In appreciation a vote of thanks was tended our representative.

Following Mr. Holberton's paper, on the same evening, was a talk by Dr. Steinmetz which was most entertaining and of particular interest to the members of our organization. Dr. Steinmetz spoke on the future of the electrical industry, and in so doing he practically described just such a great organization as the Pacific Gas and Electric Company. Mr. Holberton succeeded in detaining Dr. Steinmetz after his talk, and showed him by reference to slides depicting our system as a whole that we were practically doing in California today the very things which he had predicted would be done at some future time.

Dr. Steinmetz stated that the great improvement in the art must come with a growth of the electrical systems, to include not only the diversified interests in any particular City but, also, a gradual extension of all trunk systems in order that the diversity factor might become greater and, thus, the load factor materially improved. Dr. Steinmetz stated that so important had this become that political bodies would recognize it and would create laws giving corporations the right to condemn for the purposes of building these great trunk lines. Readers of the Pacific Gas and Electric Magazine are probably aware that this is a law in California at the present time. Dr. Steinmetz brought out another point in suggesting that a system might become so extensive as to permit of the load factor being improved, due to the difference in the time of the peak occasioned by the difference in longitude of the several cities which might be inter-connected in one vast system.

This is quite a new thought, and Mr. Holberton tells us that in figuring this out quickly he found that were our system to be developed from east to west to the same extent that it has been from north to south, there would be a material difference in time of occurrence in peak load at the extremes of our system.

The new line which we are building from Drum Power House to Cordelia practically compares with the great trunk lines which Dr. Steinmetz spoke of.

"Pacific Service" was represented also by Mr. Samuel Insull, who besides being President of the Commonwealth Edison of Chicago is a director of this company. Dr. Thomas A. Addison, Pacific Coast representative for the General Electric Co. was there accompanied by Mrs. Addison.

Mr. Holberton found that those members of the National Electric Light Association whom the Electric Development League of San Francisco had the pleasure of entertaining in San Francisco, on their wa yto Seattle, were still talking of the splendid reception which they had received, and due largely to this feeling, coupled with the general appreciation of the work done by this corporation, Mr. Holberton was elected Secretary for the ensuing year.

From Virginia Hot Springs, Mr. Holberton journeyed to New York and thence to Schenectady where he repeated his lecture before the Schenectady section of the American Institute of Electrical Engineers, on Tuesday evening, September 17th. While in Schenectady, Mr. Holberton saw the building of the great motor generators which are to be shipped out to San Francisco for the operation of the municipally-owned Geary Street railroad. All through the East Mr. Holberton found great interest taken in California enterprises and in the Pacific Gas and Electric Company in particular. All expressed their desire to be with us in 1915.

The Woodland Substation now nearing completion will be without a doubt one of the handsomest structures on the system.

This station was designed in an endeavor to originate a type of structure which would be distinctive and which would be adaptable and could be used for all future stations and sub-stations of the Company.

It was designed by Mr. I. Frickstad of the Engineering Department and is a Mission-Spanish Style of Architecture. There is no question that the building is of a type quite distinctive and which if used over the entire system would have a considerable advertising value. Because of its Mission Style it would seem peculiarly appropriate for use in California by one of the largest of California Corporations.

Mr. E. C. Jones, our world-famous gas engineer, left for the Atlantic seaboard October 11th to attend the convention of the American Gas Institute at Atlantic City, New Jersey.

Mr. Jones goes armed with credentials from President Moore of the Panama-Pacific Exposition and, also, from the Convention League of San Francisco, to represent these enterprises in an endeavor to secure the 1915 convention of the American Gas Institute for the World's Fair City.

What the Press Has to Say

Electricity is the Theme of Lecture

Corporation Official Tells of Struggle in Development of Power

Large Audience hears Illustrated Address at the Macdonough

The romance of light and heat and the struggle made by man to capture and use these elusive agents was told in graphic form to a large audience at the Macdonough Theater last evening by John A. Britton, one of the pioneers of the Pacific Coast in gas and electric work and now vice-president and general manager of the Pacific Gas and Electric Company, a corporation which handles a territory larger in area than perhaps any other of like character in the United States. The lecture was copiously illustrated with stereopticon views, gathered by Mr. Britton in his long years of service in California.

In the matter of harnessing the waters of the mountains to create hydro-electric energy, and in the daring achievements in long distance transmission of power, California has been a pioneer. John A. Britton has been intimately associated with the work of one of the greatest power companies of America, and if the history of his life could be written adequately, it would of necessity stand also as a history of the development of hydro-electric energy transmission for commercial uses, and of the development of gas lighting and heating.

Britton is a man of vital personality, and in every moment of his work has taken a deep and far-seeing interest in the development of artificial light and heat. The extraordinary evolution and branching out of this work has taken place during the active lifetime of the gas and electric company official, and in telling the story of that evolution last night he handled the facts with a picturesque detail and with a touch of romance that gave the subject matter its true interest and value.

ESTABLISHES PRECEDENT.

The plan of having a high official of a public service corporation present himself as a lecturer before the public to take the public into the confidence of the corporation, explain its workings, show the difficulties involved in obtaining service and the triumphs achieved, is a new departure, it initiates a precedent that may be followed in time with advantage by other corporations.

The Pacific Gas and Electric Company has been noted for its boldness in this sort of pioneering, as well as in that of gaining good service by daring engineering projects. Last year a large railroad passenger coach was fitted up as a demonstration car with full equipment to show the various uses to which gas and electricity could be put, especially with regard to farm life, and this car was sent over the routes of the railroads within the territory covered by the Pacific Gas and Electric. Over 6,000 people visited the car. According to Britton the use of gas and electricity, especially the latter, has almost revolutionized agricultural life.

TRIBUTE TO OAKLAND.

Britton opened his lecture last evening by paying a tribute to Oakland as his home town and the town he loved above others. In 1882 Britton was engineer and fireman of the first electric plant in Oakland, the old building being erected at Second and Washington streets, with a capacity of 35 horsepower. Today the plant generates 15,000 horsepower. In telling the story of light and power, Britton first gave a short review of the history of artificial lighting. He said:

"It is with deep appreciation of the interest that has called out so large an audience that I stand before you tonight. It is an inspiration to me. I feel like referring to the story of the prodigal son, who when he returned was made the recipient of all good things. This is in a measure a return for me to Oakland. I once trod your streets as a fellow citizen from day to day, and now I have come back to face you again. Oakland will always be a place beloved by me. Here I made my home, here my children grew to womanhood and manhood. I love the old town.

PIONEER IN FIELD.

"The Pacific Gas and Electric was a pioneer in hydro-electric engineering. Others have taken advantage of the snows of the high Sierras and have utilized the flowing waters, but they have followed largely in our footsteps.

" 'Pacific Service' is given over a territory of more than 35,000 square miles, in which territory we operate an electric hydroelectric installation of 93,000 horsepower, the largest of any company in California. 'Pacific Service,' with the Great Western Power Company, the Northern California, the American Lighting Company, the Southern California Lighting Company, the Southern California Power Company and several other concerns, generate by hydro-electric installation a total of 350,000 horsepower in the State of California. Steam generation gives us about an equal amount, so that today California boasts about 700,000 horsepower of electric energy in use in her manifold industries.

"At the same time gas still remains, and from day to day new uses for gas in heating, lighting and power are discovered by the use of new machinery and methods. I am ready to prophecy that it will not be long before electricity will be relegated to the place into which gas was thrown when electric power began to be understood and developed.

"This is the centennial of the use of gas as artificial light in a commercial sense. One hundred years ago in London the first company was formed to supply consumers with coal gas.

"How people from the dawn of history got along without this artificial light up to about 1450 years before Christ, when we have the first records of such light being used, we can only guess. About that time we have records of the use of braziers and burning-pans, while about B. C. 500 we find something like an oil lamp in use. The Greeks knew about the use of coal about B. C. 300, but it was not until A. D. 1000 that coal came into commercial use, and that for the first time in England.

"In 1660 Philip Shirley, in laboratory experiments, manufactured coal gas, but it was not till 1792, when William Murdock produced coal gas by destructive distillation that the commercial value of the product was realized. In 1807 the streets of London were first lighted with gas, and in 1812 the inhabitants were supplied in their homes with a gas for the first time, lead pipes being used as the means of distribution.

"In 1816 gas came to America and was used in Baltimore, and in 1854 it was first used in California, San Francisco being the city with the first gas plant. Oakland received gas in 1867.

"It is only twenty-two years since electricity became a fixed commercial factor. No one dare prophecy today what may not be done with gas and electricity, or what form of lighting and heating may suddenly supercede them."

FROM TORCH TO ELECTRICITY.

The remainder of the lecture last night consisted of a sketchy account of numerous stereopticon views illustrating the growth and development of electricity and gas distribution and their use in California and on the Pacific Coast. The views included pictures of old lamps and braziers and torches of prehistoric times, views of machinery used in the manufacture of gas, of coal tar, of views of hydro-electric installation and transmission plants, and of the properties of the Pacific Gas and Electric.

The old gas plant as it stood at Christmas, 1869, when there was a grand total consumption of gas in twenty-four hours of 49,000 feet, was shown and compared with the present great tanks whose capacity was not strained by the Christmas consumption of last year amounting to 6,000,000 cubic feet of gas.

The process of manufacturing gas was illustrated, and the changes which have resulted in economy and betterment of service traced. Interesting in this was a picture of a gas bill, rendered and paid in Oakland in 1877, when the rate was $4 per 1000 feet.

The reciprocating and turbine engines were shown and explained and views were given of the high Sierran lakes used by the company and of the dams and dam sites now being planned and constructed.

TRIBUTE TO PIONEERS.

A tribute was paid to Livermore and Gallatin, pioneers in using hydro-electric power and in attempting the transmission of power any distance for use in cities. Pictures were shown of the plant erected by these men at Folsom, where 800,000,000 gallons of water are used each day in the creation of electrical energy, only 12,000,000 gallons a day being used by the city of Oakland. The work of John Martin, one of the great pioneers of California in hydro-electric development, was also explained and commended for its daring and originality.

The lecture closed with views of the big South Yuba dam site, where one of the largest dams in the world is to be constructed for the Pacific service, a dam 300 feet high, to cost $6,500,000, and to dam water which will cover an area of 820 acres and hold about 30,000,000,000 gallons of water.

Oakland (Cal.) *Tribune*, September 12th, 1912.

Good Service — Reduced Cost

Burlingame Expresses Satisfaction With the Company's Efforts to Please Patrons

"The public be blanked," which is said to be the sentiment of most corporations, is not the policy of the Pacific Gas and Electric Company towards its patrons here. It spares no effort to see that their wants are supplied and that the service is at all times as perfect as the company claims. During the past week the company has had a gentleman in the field interviewing gas and electric consumers and telling them among other things how to reduce their bills. This sounds unusual, but it is true. George E. Lanz, an electrical engineer, who knows the business from A to Z is filling this position and he is doing it so well that many of the large consumers of current have by following his advice, saved one-half and over of their light bills. He recommends the use of the Mazda (Tungsten) lamp with reflector, which the company supplies at cost. There are a number of types of these lamps which are suited to all kinds of uses. They consume less current and give a brighter light than any other lamp made.

This is but one particular in which Mr. Lanz helps out the consumers. He also advises as to the economical installation of wires, the use of motors and shafting, and the use of gas, and he gives his advice free. He will visit every large consumer in the district.

Burlingame has other reasons to be satisfied with the treatment accorded by the Pacific Gas & Electric Co. for it was only a few weeks ago that the company granted, at the request of Mayor McGregor, a reduction in lighting rates amounting to about 25 per cent. The company's popular manager of this district, Mr. E. W. Florence, is ever ready to lend his assistance to make the gas or electric service the best possible. Since he took charge here gas consumption has increased nearly 50 per cent and mains have been extended right and left.

Burlingame (Cal.) *Advance*, Aug. 30, 1912.

PACIFIC GAS AND ELECTRIC COMPANY

DIRECTORS

F. B. Anderson
Henry E. Bothin
John A. Britton
W. H. Crocker
E. J. De Sabla, Jr.
F. G. Drum
John S. Drum
D. H. Foote
Wm. G. Henshaw
A. F. Hockenbeamer
Samuel Insull
John Martin
C. O. G. Miller
Louis Sloss
George K. Weeks

OFFICERS

F. G. Drum	President
John A. Britton	Vice-Pres. and Gen. Mgr.
A. F. Hockenbeamer	2d Vice-Pres., Treas. and Comp.
D. H. Foote	Secretary and Asst. Treasurer
J. C. Love	Asst. Treasurer
Charles L. Barrett	Asst. Secretary

HEADS OF DEPARTMENTS

M. H. Bridges	Auditor
W. H. Kline	General Agent
R. J. Cantrell	Property Agent
George C. Robb	Supt. of Supplies
J. H. Hunt	Purchasing Agent
E. B. Henley	Manager Land Dept.
J. P. Coghlan	Manager Claims Dept.
H. Bostwick	Secretary to President
F. S. Myrtle	Manager Publicity Dept.
L. H. Newbert	Manager Appliance Dept.
G. C. Holberton	Chief Engineer Stockton Water Dist.
W. B. Bosley	Attorney
H. C. Vensano	Civil Engineer
E. C. Jones	Engr. Gas Dept.
H. P. Pitts	Industrial Engineer
S. V. Walton	Manager Commercial Dept.
S. J. Lisberger	Engr. Electric Distribution
Sherwood Grover	Asst. Engr. Gas Department
J. P. Jollyman	Engr. of Electric Construction
P. M. Downing	Engr. O. & M. Hyd.-Elec. Sect.
C. J. Wilson	Asst. Engr. Electric Distribution
F. H. Varney	Engr. O. & M. Steam & Gas Eng. Sect
F. G. Baum	Chief Engineer Hydro-Electric Department

DISTRICT MANAGERS

District	Headquarters	Manager
Alameda Co.	Oakland	F. A. Leach, Jr.
Berkeley		
Oakland		
Antioch	Antioch	F. J. Southerland
Chico	Chico	H. B. Heryford
Colusa	Colusa	L. H. Hartsock
Contra Costa	Martinez	Don C. Ray
Fresno	Fresno	W. M. Henderson
Grass Valley	Grass Valley	John Werry
Marysville	Marysville	J. E. Poingdestre
Marin	San Rafael	W. H. Foster
Napa	Napa	O. E. Clark
Nevada City	Nevada City	John Werry
Petaluma	Petaluma	H. Weber
Placer	East Auburn	H. M. Cooper
Redwood	Redwood City	E. W. Florence
Sacramento	Sacramento	C. W. McKillip
San Francisco	San Francisco	G. C. Holberton
So. San Francisco	So. San Francisco	Frank P. Edwards
San Jose	San Jose	J. D. Kuster
Santa Rosa	Santa Rosa	M. G. Hall
Solano	Dixon	C. E. Sedgwick
Stanislaus	Newman	W. A. Widenmann
Vallejo	Vallejo	A. J. Stephens
Woodland	Woodland	W. E. Osborn

MANAGERS OF WATER DISTRICTS

Colfax (Alta)	Jas. Martin
Nevada (Nevada City)	George Scarfe
Placer (East Auburn)	H. M. Cooper
Standard (Electra)	W. E. Eskew
Stockton (Stockton)	J. W. Hall

SUPERINTENDENTS OF POWER DIVISIONS

Colgate	Miles Werry
De Sabla	I. B. Adams
Electra	W. E. Eskew
Marysville	E. C. Johnson
Nevada	George Scarfe
North Tower	C. D. Clark
Oakland	William Hughes
Sacramento	J. O. Tobey
San Jose	J. O. Hansen
South Tower	A. H. Burnett
Stockton	E. C. Monahan
Solano	J.W. Coons

SUPERINTENDENTS OF STEAM ELECTRIC STATIONS

H. N. Mosher	Chief Engr. Station "C," Oakland
C. A. Eastwood	Chief Engr. Station "A," San Francisco
T. E. Fogalsang	Supt. Generating Statn., San Francisco
J. W. Varney	Supt. of Sub-Stations, San Francisco

SUPERINTENDENTS OF ELECTRIC DISTRIBUTION

Berkeley	J. H. Pape
Oakland (Underground)	R. C. Powell
Oakland and Alameda (Overhead)	A. U. Brandt
Sacramento	C. R. Gill
San Francisco	A. R. Thompson
San Jose	A. C. Ramstad
Valley District (Chico, Marysville, Woodland and Colusa)	W. F. Blide

SUPERINTENDENTS OF GAS WORKS

Martin Station	John Mitchell
Oakland	A. C. Beck
Sacramento	Edward S. Jones
San Francisco	Dennis J. Lucey
San Jose	R. H. Hargreaves

SUPERINTENDENTS OF GAS DISTRIBUTION

Oakland	George Kirk
San Francisco	D. E. Keppelman
Superintendent of Railway Department	N. J. Hullin

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 1,800 people.
OPERATES 11 hydro-electric plants in the mountains.
5 steam-driven electric plants in big cities.
16 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,775 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

Well! says HARDY!!

I have helped your co-workers

I can help you.

WHY NOT ASK ME!

C. E. HARDY
165 Second St.
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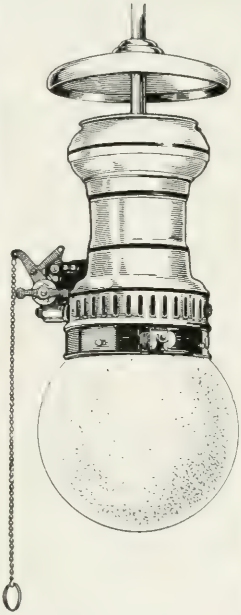

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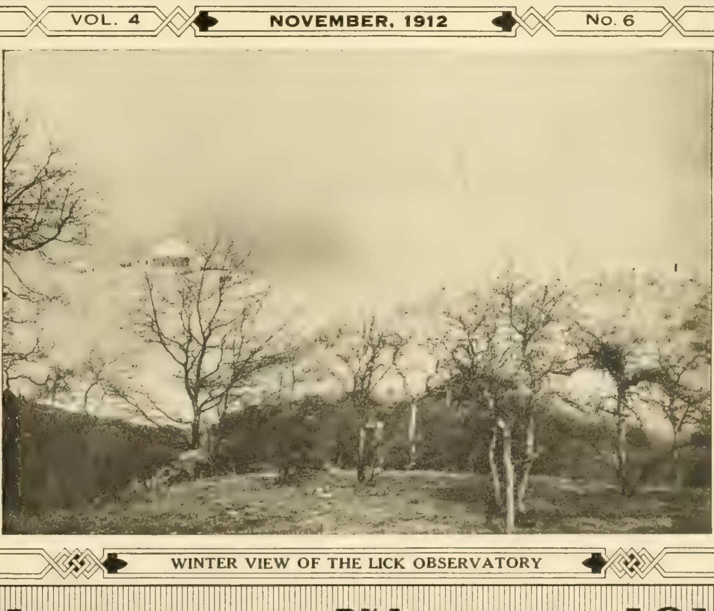
PACIFIC GAS AND ELECTRIC MAGAZINE

Published Monthly by
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO

VOL. 4 NOVEMBER, 1912 No. 6



WINTER VIEW OF THE LICK OBSERVATORY

"WINTER TO WINTER, 1915"

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Pacific Gas and Electric Magazine

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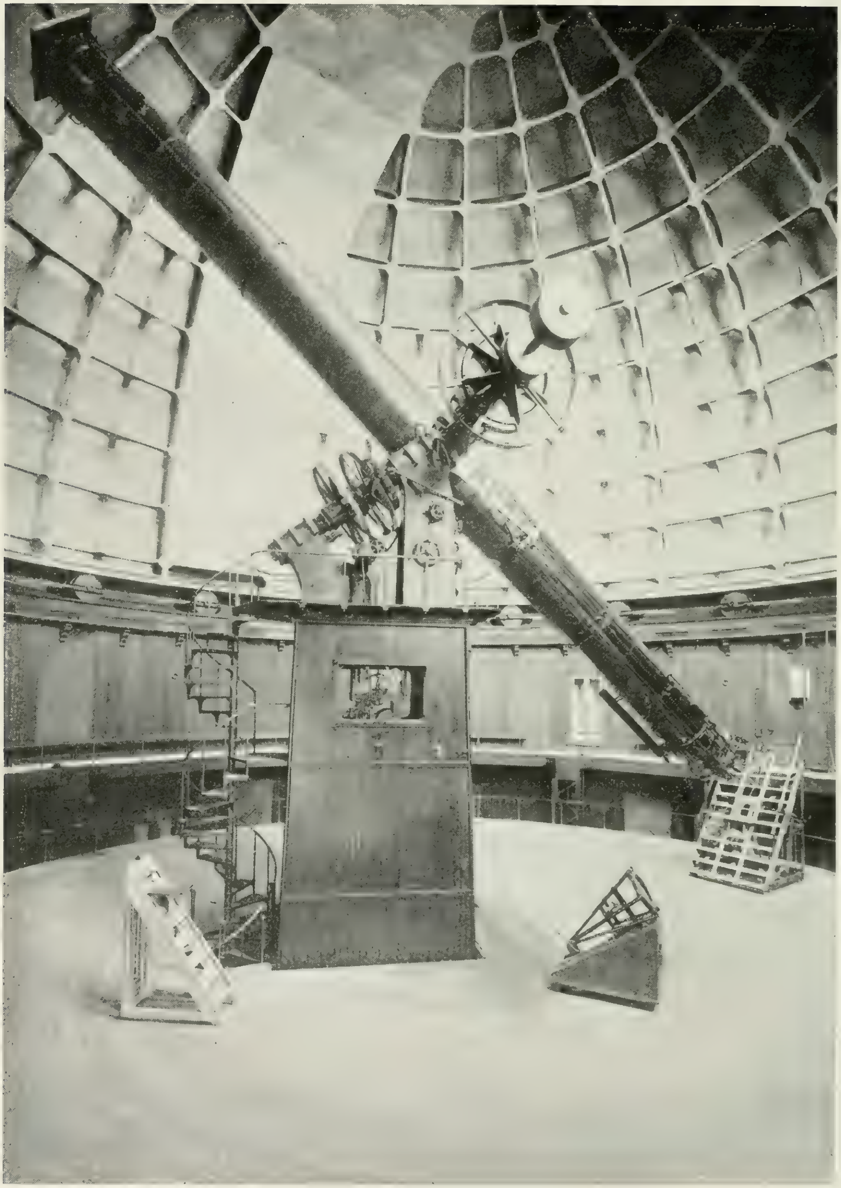


THE 36-INCH REFRACTOR TELESCOPE AT THE LICK OBSERVATORY
Beneath this is the tomb of James Lick

PACIFIC GAS AND ELECTRIC MAGAZINE

VOL. IV NOVEMBER, 1912 No. 6

Where They Commune with the Stars; the Lick Observatory on Mount Hamilton

By FREDERICK S. MYRTLE, Publicity Manager.

F. S. Myrtle

Perched on the top of Mount Hamilton, 4,209 feet above sea-level, looking down upon the wondrous glories of the Santa Clara Valley, the Lick Observatory stands out against the sky, proudest of proud monuments to one who used the fruits of his pioneer industry to benefit mankind.

The story of James Lick has been told many times and oft. He was one of the earliest pioneers, for he came to San Francisco in 1847, and when he died in 1876 the people of California knew that a great public benefactor had passed from among them. For, the large fortune he had accumulated by unremitting toil was devoted by deed of trust to public purposes. Upwards

The Observatory from the East

of $1,000,000 went to the Association of California Pioneers; more than $1,000,000 to the California Academy of Sciences; $450,000 to the California Institute of Mechanical Arts; $100,000 for statuary to be erected in front of the City Hall, San Francisco; $60,000 for a monument to Francis Scott Key in Golden Gate Park; $100,000 to be expended in the construction of an Old Ladies Home in San Francisco; $150,000 for a Free Public Bathhouse; last, but by no means least, $700,000 for the construction of an Observatory to be fitted up with the most powerful telescope ever designed by man.

Mr. Lick made public announcement of his beneficent purpose three years before he died. It is written of him that he was not a student of astronomy, nor was he specially interested in scientific questions, but he was impressed with the grandeur of astronomical discovery and desired in this way to found an institution whose usefulness to mankind should be perpetuated. The section of the deed of trust by which provision for the Observatory was made read:

"To expend the sum of seven hundred thousand ($700,000) dollars for the purpose of purchasing land, and constructing and putting up, on such land as shall be designated by the party of the first part, a powerful telescope, superior to and more powerful than any telescope yet made, with all the machinery appertaining thereto and appropriately connected therewith, or that is necessary and convenient to the most powerful telescope now in use, or suited to one more powerful than any yet constructed; and, also, a suitable observatory connected therewith."

The trustees named were Messrs. R. S. Floyd, Wm. Sherman, E. B. Mastick, Charles M. Plum and George Schoenwald, and the instructions given them were to carry out the work of construction and when completed turn the whole over to the Regents of the University of California.

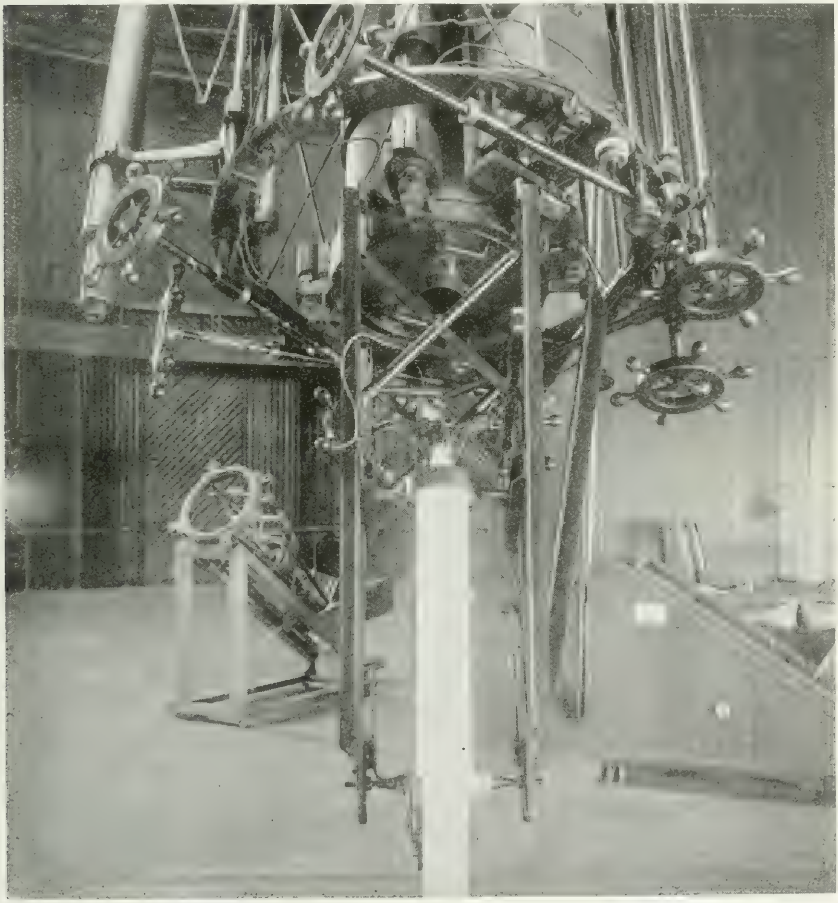
The selection of a suitable site was not made until every possible location in the Sierra Nevada mountains and the Coast Range had been considered. The records show that in June 1876, James Lick wrote to his trustees informing them that he had selected the summit of Mount Hamilton, in Santa Clara County, as the site for the Observatory. A tract of 2,600 acres, in all, was secured, 2,030 acres by grant of Congress, 320 acres by grant of the State Legislature and the balance by private purchase and gift, and Mr. Lick got the supervisors of Santa Clara county to build a winding road to the mountain summit, at an expense of $78,000.

Mr. Lick did not live to see his project carried into execution. His death took place in San Francisco, October 1st, 1876, just after the preliminaries had been arranged. But the provisions of his trust were faithfully carried out, and on June 1st, 1888, the completed Observatory was transferred to the Regents of the University and the work of scientific observation and experiment entered upon.

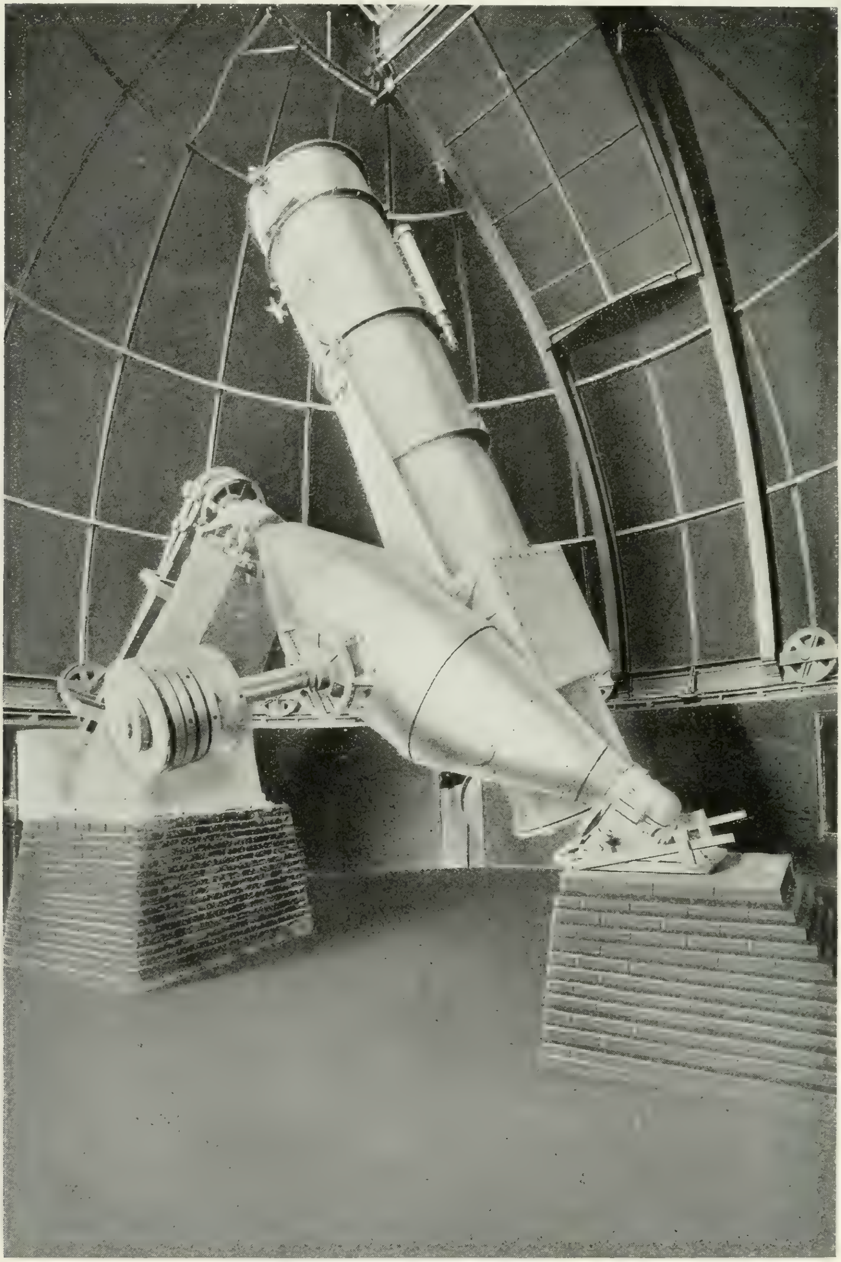
How this work has progressed is a matter of history. Today the eyes of the scientific world are upon California; for here, in this perfect climate, Dame Nature aids man's intellect in the solution of problems which have puzzled astronomers of the old world for ages.

The visitor to the Lick Observatory starts from San Jose and takes his way in an easterly direction over a good stage road winding by hill and dale through some of the finest vineyard country in the State. Although but 13 miles as the crow flies the distance is 27 miles by road; and at a place called Smith Creek, 20 miles out, the final ascent begins. The first glimpse of the Observatory gives one the impression of an ancient citadel somewhere in Eastern Europe or Asia that had withstood many a siege in the days when the history of the old world was being made. It certainly presents a picturesque spectacle, standing out against the blue California sky with the sun shining upon its domes. The illusion must have been still more striking in the old coaching days; but in this twentieth century the motor has displaced the stage, and before one has had time to complete the mental picture he finds himself at the summit.

Located there is a tiny settlement that is a veritable bee-hive for industry. Besides the main office building there are shops for the workmen, dwelling houses for the astronomers, students, and employees, and a schoolhouse. These, with the dome containing the great Lick telescope, are situated on the central peak of the mountain. On another eminence a short distance away lies another group of buildings, prominent among which stands out the dome of the Crossley reflector. Two other peaks are used for reservoir purposes. In a booklet on the Lick Observatory of date 1902 we read, "This system receives its supply from the winter rains falling on the roofs, the water being pumped to the reservoirs on the higher peak by means of windmills." Changes have taken place since that was written. There has been installed an electric lighting and power system to meet



The Mills Spectograph that has wrought wonders in aiding observation of the stellar system



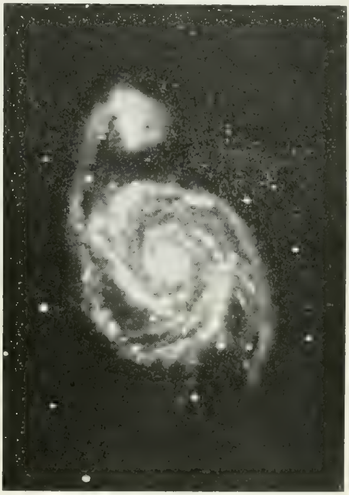
The Crossley Reflector at the Lick Observatory the thousand and one daily needs of the institution, such as turning the large domes, winding the driving clocks of the large telescopes, supplying current for the spectroscopic department of research, operating the water pumps at the springs in the canyons, and so on.

On arrival we are met by Professor W. W. Campbell, Director of the Observatory, who takes us at once into the main building and shows us the library. This is indeed a feature of the institution. The record of 1902 points with pride to a collection of 5,000 books and 4,800 pamphlets; Professor Campbell tells us the library has been increased fully 50 per cent since that time. From the library to the dome which contains the big telescope is a matter of but a few steps, and in another moment we are standing upon a platform and gazing in admiration upon the 36-inch refractor. Beneath us, at the bottom of the pedestal that supports the telescope, James Lick lies buried, and we are permitted to read the simple inscription on the tomb of this great man who gave so much to science.

Professor Campbell acts as guide. He explains the mechanism of the refracting telescope and, also, of the spectograph attached thereto that has performed wonders in aiding visual observation of the stellar system. He explains that there are two lenses, of 36 in. diameter, with an 8 in. air space between, and that these lenses as they receive the rays of light bend or refract them and bring them to a focus near the lower end of the telescope where the observer is placed. We are told that since this telescope was constructed a still larger one, of 40-in. diameter, is to be found in the observatory of the University of Chicago, situated on the border of Lake Geneva. But, states our illustrious guide, there must be a limit to the size of such instruments.

"In refracting telescopes the lenses must be supported at the edges," says Professor Campbell, "and when anything larger than a 40-inch. construction is attempted the bending of the lense under its own weight seriously interferes with its performance of its work."

We are told that planetary surfaces and the study of double stars are the principal matters of visual observation just now. "We know enough about the solar system to suit our purposes," says Professor Campbell, "and are now trying to get order out of chaos in the stellar system. This we are doing by means of the spectroscope. Here, with the aid of our beautiful climate, we are observing the bright stars in the northern sky, while in our branch observatory in Chile we are making scientific observation of the stars in the southern sky." There is a digression here to admit of a description of this branch institution, which was the gift of the late D. O. Mills and is situated near Santiago, Chile. The equipment of that observatory consists of a 37-in. reflector telescope and suitable spectrographs. Concerning this Professor Campbell says:



Nebula photographed by the Crossley Reflector

"The sole purpose of the Observatory is to supply a knowledge of the velocities of

Looking down upon the Santa Clara Valley

southern stars to or from the observer. The summit of the peak on which the Observatory is situated is 1,000 feet above the level of the city of Santiago. The site is very satisfactory in that the atmospheric conditions are favorable for the Observatory's line of investigation; and incidentally, as I am told, the view of the Andes from that location would be difficult to equal."

Climate, of course, plays an important part in astronomical experiment, and that in a great measure accounts for the remarkable success which has been achieved here and in South America. Professor Campbell tells us that from the year 1896 to last year, inclusive, three nights a week, on a average, were available for observation purposes, and that the same average is recorded from the Chilean observatory ever since its foundation eight years ago.

"We are in a position to tell where any member of the solar system was, is or will be, and we know when eclipses will take place," says Professor Campbell. "Now we are investigating the scale upon which the stellar system is constructed. Already we have discovered it to be fully 60 per cent larger than astronomers had supposed, and right here, in this Observatory, was made the remarkable discovery that the older stars travel more rapidly than the new ones, that there are forces at work increasing the motion of stars the longer they live.

"This discovery is of tremendous importance in the study of the evolution of the stellar system.

"Another important stage has been reached in the visual observation of double stars. Years ago it was discovered that many stars thought to be single were really double, and the average was placed at about one in 35. Professor Aitken here, who has been conducting this branch of the work, succeeded early in doubling that average, and now his spectroscopic observation has brought the average up to about one in 4.

"We observe stars today by rays of light that left those stars 5,000 years ago. It is nothing strange to note phenomena which in all probability occurred before the birth of Christ. We are engaged in solving problems of the evolution of celestial bodies, including their history and conditions, their relations to each other at the present time and what the future holds in store for them.

"In all this there is nothing that can be strictly called new. What we are really doing is putting our house in order, if we may apply that term to our work of scientific observation."

What Professor Campbell does not tell us is that his values of the motion of stars through space, as to both direction and velocity, are the most accurate ever known to have been made, and further reports upon his work are awaited with the greatest possible interest by astronomers all over the world. This we learn from his associates, one of whom, Professor Aitken, elaborates upon the work of stellar observation.

"We are dividing our stars up according to the stages of their development," he says. "Too much importance cannot be attached to the discovery that the older stars move the faster. It is one of the most remarkable discoveries we have made. It reveals a law of the stellar universe for which we must yet find the explanation."

Concerning his particular work in observing double stars Professor Aitken tells us that he finds the percentage of these phenomena greater in the region of the milky way than away from it. But he tells us modestly, "My survey on that point is not yet complete."

In due course we are taken over to the Crossley reflector, a telescope that was presented to the Lick Observatory in 1895 by Professor Crossley, of Halifax, England. It is of English manufacture but was almost use-

The branch observatory near Santiago, Chile less over there because of the foggy climate. Professor Curtis is in charge here, and he tells of his wonderful work in photographing nebulae. The reflecting telescope is used entirely for photographic work, and, according to Professor Curtis, photography has almost supplanted visual work in astronomical observation.

"We get stars that are absolutely invisible to the naked eye," he says. "The work of my predecessor Professor Keeler was epoch-making, and when Halley's comet visited us we succeeded in getting a larger and more complete set of pictures of it than were taken anywhere else.

"Our present work concerns the structure and evolution of the nebular systems."

We are told that in both hemispheres, in California and in Chile, the work of the Lick Observatory has taken the lead in developing the reflector telescope and showing its remarkable powers.

There are other matters of interest to be seen during a visit to the Lick Observatory. Space does not permit of their discussion here. The booklet I have referred to contains full particulars of the Observatory's equipment, to which there have been no important additions in the way of instruments since 1902. It is worthy of mention, however, that some 400 acres have been added to the Lick Observatory reservation. The following at present constitute the Observatory staff:

W. W. Campbell, Director and Astronomer; R. H. Tucker, R. G. Aitken, W. H. Wright, H. D. Curtis, Astronomers; J. H. Moore, Acting Astronomer, in charge D. O. Mills Observatory, Santiago, Chile; Mrs. J. H. Moore, Assistant, D. O. Mills Observatory, Santiago, Chile; Miss A. M. Hobe, R. E. Wilson, G. F. Paddock, Assistants; R. F. Sanford, Assistant, D. O. Mills Observatory, Santiago, Chile; Paul W. Merrill, Carl C. Kiess, J. H. Pitman, Fellows in Astronomy; Miss E. Poebe Waterman, Vassar College Fellow in Astronomy; Miss Ruth Standen, Secretary. They are all hard and enthusiastic workers.

IN MEMORIAM—EDWIN LOOBLINER

AN APPRECIATION

There devolves upon us the very painful duty of chronicling here the untimely death of Edwin Loobliner, Estimating Engineer of the Contract Department of the San Francisco District, who slipped from the rocks into the sea and was drowned while fishing near Bolinas Bay on Sunday, October 6th, 1912.

But 28 years of age and the devoted support of a widowed mother and two sisters, he has left a gap that cannot be filled in the hearts of all that loved him—and to know him was to love him. In this hurrying age we rarely find linked to capability the virtues of unselfishness and unfailing consideration for others, but such were the qualities which distinguished the every day life of Edwin Loobliner and endeared him to a greater circle of friends than his modest soul ever realized. As for his co-workers, who knew him in the intimate association of daily work—we cannot set bounds to his loss nor tell with what a profound shock we first heard of his death. Words are but poor things at best with which to express the deeper feelings, and so it is not possible to adequately convey to the bereaved family our deep and abiding sympathy for them. They, as we, must perforce believe that "nothing good is ever lost," and that, mercifully, his end was a quick and painless one.

DAVID SEID.

Henry Sonneborn

Earl Northrop

J. B. Brooks

Our Oakland Boys "Progress"

"PROGREDIOR; I PROGRESS." Under this ambitious title the employees of Oakland Power Division have organized a club of the progressive order which bids fair to become a valued factor in the permanent establishment of the "get together" spirit which is called for in "Pacific Service." The particulars of this new organization are furnished by Earl Northrop, First Vice-President, who tells us:

"The ever-present and growing desire to increase our knowledge of that most beneficial and useful of all our modern necessities, Electricity, the control of which we are daily, some of us nightly, engaged in, has resulted in the successful launching of an employees' club, which has for its object the advancement of its members in the science of electricity, to create good fellowship, and to furnish a means of keeping in touch with the progress made in our chosen field of endeavor.

"It does not require a very vivid imagination to see great possibilities and a constantly growing demand for such organizations in our Company, (see rule 1, under General Rules, in the book of 'Rules and Regulations for Employees', Pacific Gas and Electric Company), and while we admit that our original motive is, or rather was, a little selfish, still we feel that anything which will tend to promote co-operation or increase our knowledge of the best and most efficient methods of handling the expensive apparatus daily intrusted to our care cannot help but prove a powerful adjunct to 'Pacific Service,' and so in keeping with the Company's progressive policy we beg to introduce to our fellow employees and the readers of our Magazine, 'THE PROGREDIOR CLUB' of Oakland.

"The Club bids fair to live up to its name, which means to progress, to go forward, and has, so far, exceeded the most sanguine hopes of the men on the night shifts at Station 'A', Oakland, who having been assured of the heatry co-operation of their superintendent, Mr. Wm. Hughes, had the courage to start the undertaking. A night section for the benefit of those who cannot attend the day meetings had to be inaugurated, and at a well-attended meeting on August 20th Mr.

F. R. George, Chief Load Dispatcher, gave us a very interesting talk illustrated with stereopticon views covering in a general way the various properties of the Company.

"We are indebted to the Oakland Y. M. C. A. who have generously given us the use of a hall and equipment free of charge, and we wish to convey to them, through the columns of our Magazine, our appreciation of their courtesy; also to the management of the Company for the use of their new 'Balopticán' and their assurance that the engineers and others will from time to time lend us their assistance. A hearty invitation to attend the meetings is extended to operators and other employees who happen to be in 'My City—Oakland' or in its vicinity on their vacations. To the Garcia Club of Fresno, and other similar Company organizations, we extend our compliments, and warn them to look well to their laurels, for THE PROGREDIOR CLUB is on the map.

OFFICERS OF THE PROGREDIOR CLUB

Henry Sonneborn, President; Earl Northrop, First Vice-President; J. B. Brooks, Secretary-Treasurer.

Executive Board: L. Whitehurst, Chairman; C. Darling, M. F. Gallagher, T. Cox. A Second Vice-President and another member for the Executive Board to be elected from the members of the night section.

◆

"Pacific Service" is Proud of its Drafting Department

In this number we present to our readers some pictures of the Drafting Department, a department of "Pacific Service" which comes not much into the limelight but, nevertheless, plays an important part in the general organization.

At the head of this department is Mr. Joseph P. Baloun. He is an enthusiast, and has contributed many useful articles to the Pacific Gas and Electric Magazine. Concerning the department of which he is so justly proud he has this to say:

"The corps of professional men that make up a drafting department can be compared to the ever ready sharp edged tool amongst the kit in the tool-box. In just the same manner that each tool is used when called upon to do a certain piece of work properly, so is each department obliged to be kept in a constant state of readiness for its proportional share of service. The system of organization is strongest when all of its departments or links are perfectly strong.

"In the same manner that the various offices of a company are tied and interconnected, just so should the individual designers with their assistants co-operate in all matter of detail of execution and general harmonious relationship. The writer believing that he has such a perfect family doing all the necessary civil, mechanical, electrical and topographical work of the largest heat, light and power corporation in the West, is pleased to 'show off' these capable persons in the accompanying photographs."

So are we.

Chief Draftsman Joseph P. Baloun and his staff

Mr. Baloun at work on some drafting problems

DOINGS OF OUR COMPANY SECTION N. E. L. A.

By HENRY BOSTWICK.

The following are the minutes of the first meeting of the "Pacific Gas and Electric Company Section" of the National Electric Light Association, which was held on the evening of October 17th, 1912:

A meeting of the employees of the Pacific Gas and Electric Company who are Class "B" members of the National Electric Light Association was called to order at 7:30 o'clock P. M. on Thursday evening, October 17th, 1912, for the purpose of perfecting the organization of a "Pacific Gas and Electric Company Section" of the National Electric Light Association, at which the following members were present: Harry Abernethy, Henry Bostwick, R. C. Bragg, A. U. Brandt, J. D. Butler, R. Crowell, Chas. Dallerup, H. L. Ekenroth, F. C. Ensinger, E. W. Florence, C. A. Gaines, F. S. Gray, H. B. Hartfield, W. L. Johnstone, H. G. Keesling, Otto A. Knopp, H. S. Lane, F. A. Leach, Jr., S. J. Lisberger, Eugene G. McCann, Spencer Moore, L. H. Newbert, C. B. Ohnemuller, J. H. Pape, F. C. Piatt, H. P. Pitts, A. G. Ramstad, L. S. Ready, A. J. Theis, W. J. Walsh, C. J. Wilson, Ross H. Fritchey and W. G. Schmidt.

On motion duly made and seconded Mr. Henry Bostwick was elected Chairman pro tem, and Mr. F. S. Gray, Secretary pro tem.

The first order of business was the adoption of the Constitution and By-laws.

The Chairman then read the Constitution and By-laws which had been prepared for presentation before the meeting, and upon motion duly seconded the same were adopted as read.

A list of the employees who are at this time members of the Association was read, and on motion duly made and seconded it was resolved that our membership list be kept open until our January meeting, at which time all employees who may have been elected as Class "B" members of the National Electric Light Association will be rated as Charter Members of the Pacific Gas and Electric Company Section.

At the present time there are 81 members enrolled in the Company Section.

The next order of business was the election of a nominating committee, and upon motion duly made and seconded the following members were elected to serve on this committee: Messrs. F. A. Leach, Jr., L. H. Newbert, S. J. Lisberger, H. P. Pitts, and Chas. Dallerup, with request that they be prepared at our next regular meeting, which will be held on Wednesday evening, November 20th, to submit their report; and at which time the officers will be duly elected to preside over the Company Section.

There being no further business, on motion duly seconded the meeting adjourned.

We wish to impress upon all employees who are Class "B" members of the National Electric Light Association that it is the desire of the management that this "Company Section" be conducted by the rank and file in every particular; and such of our employees as may be elected to the several offices can rest assured that they will have the hearty co-operation of all the officers and heads of departments of the company at any and all times, so that this company section shall in effect become an integral part of our organization.

Insofar as concerns the members of the company section who reside without the confines of the bay counties attending the monthly meetings, ways and means will later be devised whereby all such employees will be given opportunity to attend at least one monthly meeting during the year, in addition to the annual meeting of the section, as well as any special meetings that may be held by the Section, if it be deemed advisable that all members be present at such special meetings.

Notices of each monthly meeting will be mailed in advance to all members who will be entitled as above stated to be present at such meetings.

The minutes of all meetings held will be published in the issue of the magazine next following such meeting.

The following Constitution and By-laws have been duly adopted:

CONSTITUTION
AND
BY-LAWS
of
"Pacific Gas and Electric Company Section"
OF THE
NATIONAL ELECTRIC LIGHT ASSOCIATION

ARTICLE I.

NAME.

This organization shall be entitled Pacific Gas and Electric Company Section of the NATIONAL ELECTRIC LIGHT ASSOCIATION.

ARTICLE II.

OBJECTS.

The objects of this Section shall be to foster and promote the common interests of its members, through intercourse and association; and to advance, by the preparation and discussion of papers, their scientific, commercial and practical knowledge in all matters pertaining to the generation, distribution and sale of electricity.

ARTICLE III.

MEMBERSHIP

Active members in this Section shall be limited to employees of the Pacific Gas and Electric Company, or its affiliated, leased or controlled companies, who are Class B members of the National Electric Light Association.

ARTICLE IV.

Section 1. The officers of this Section shall be a Chairman, Vice Chairman, Secretary, Treasurer, and Eecutive Committee.

Section 2. The Chairman, Vice Chairman, Secretary and Treasurer shall be elected for a term of one year or until their successors have been elected and duly qualified. The Chairman shall not be eligible for reelection, either as Chairman or Vice Chairman, until after the expiration of two terms following his tenure of office.

Section 3. The Chairman shall preside at all meetings of the Section and of the Executive Committee and shall perform such other duties as may be provided for in this Constitution or by vote of the Section. In his absence, the Vice Chairman shall preside, or in the absence of both the Chairman and Vice Chairman, or by common consent, a Chairman pro tem. shall be chosen to preside. The Chairman shall submit a report at the annual meeting of the Section, giving a resume of the years' work with recommendations for the future. He shall countersign all checks.

Section 4. The Vice Chairman shall render the Chairman any assistance that the Chairman may deem necessary. In case of the absence, disability or death of the Chairman, his office shall be filled by the Vice Chairman.

Section 5. The Secretary shall keep an account of the proceedings of the Section and of the Executive Committee, and shall perform such duties as the Executive Committee may direct, subject to its approval.

Section 6. An Assistant Secretary may be appointed by the Secretary, subject to the approval of the Executive Committee. The Assistant Secretary shall assist the Secretary with the correspondence of the Section, and shall render him such other assistance as he may require.

Section 7. The Treasurer shall receive and safely keep all the funds of the Section.

He shall keep a correct account of all expenditures, and pay no bills unless authorized by the Executive Committee. He shall submit a report at the regular meetings of the Executive Committee, and an audited account for the annual meetings of the Section. He shall give a surety bond of such amount and with such modifications as the Executive Committee may from time to time determine.

Section 8. The Executive Committee shall consist of the officers of the Section and five members, to be elected by ballot.

Section 9. The Executive Committee shall be the governing body of the Section, shall exercise a general supervision over its affairs, and pass upon all applications for membership, subject to this Constitution, and such special rules and regulations as may be adopted by the Section. The officers of the Section and the Chairman of each Committee shall prepare reports and statements for the regular meeting of the Section, and devote their attention to the particular interests and general welfare of the Section. Previous to the annual meeting of the Section, the Executive Committee shall secure annual reports from each of the Committees and officers, except the Chairman, Vice Chairman, and Assistant Secretary. These reports are to be submitted to the Chairman and are to be included in part or in whole in his annual report. The Executive Committee shall place in the hands of each member of the Section a copy of its annual report. Three members of the Committee shall constitute a quorum.

ARTICLE V.

ELECTION OF OFFICERS.

Section 1. At the meeting prior to the date of the annual meeting of the Section the Nominating Committee shall be appointed by the Chairman, to be composed of members of the Section. The Nominating Committee shall bring in at the annual meeting the names of those recommended by it for the several offices to be filled by election. The submission of names by the Nominating Committee shall not, however, debar any member of the Section from making nominations for any or all of the several offices to be filled. Such nominations, duly seconded, shall be submitted for election at the time, and in the same manner as those of the Nominating Committee. Whenever there are more nominees than the vacancies to be filled, the election shall be decided by ballot. When there is no contest for office, the Secretary may be instructed by a viva voce vote to cast the ballot for those recommended by the Nominating Committee.

Section 2. Vacancies in any office, except that of Chairman, shall be filled by the Executive Committee, such appointments to cover only the unexpired term of the office vacated.

ARTICLE VI.

AMENDMENTS TO THE CONSTITUTION

Proposals for amendments to the Constitution shall be presented in writing, signed by at least three members, at any regularly stated meeting of the Section. By a majority vote of the members present at this meeting, they may be considered and amended and then ordered to be voted upon at the date of a subsequent meeting of the Section. A two-thirds vote of all members present shall be necessary for the adoption of amendments.

The Secretary shall see that a copy of the proposed amendments is furnished to each member at least ten days before the meetings at which action is to be taken on the proposed amendments.

BY-LAWS

ARTICLE I.

Section 1. The annual meeting of the Section shall be held each year on the date of the regular meeting in the month of May.

Section 2. The regular meetings of the Section shall be held on the 3rd Wednesday of each month at the hour of 8 o'clock P. M.

Section 3. Special meetings of the Section for the transaction of business or for other purposes may be held at the discretion of the Executive Committee.

ARTICLE II.

QUORUM

Ten members of the Section shall constitute a quorum for the transaction of business.

ARTICLE III.

ORDER OF BUSINESS.

The order of business shall be as follows:

1. Call to order.
2. Reading of the minutes of last meeting of Section and of the Executive Committee.
3. Reports of standing committees.
4. Reports of special committees.
5. Old business.
6. Consideration of new business.
7. The papers or lectures announced for the meeting.
8. Discussion of papers.
9. Adjournment.

ARTICLE IV.

COMMITTEES.

Committees shall be appointed by the Chairman subject to the approval of the Executive Committee. The Chairman of each of the Standing Committees must be a member of the Executive Committee.

ARTICLE V.

VOTING AND PROXIES.

Section 1. A roll call shall be ordered on the demand of ten members on any question before the Section.

Section 2. Voting by proxy shall not be allowed at any meeting of the Section or any of its Committee meetings.

ARTICLE VI.

PARLIAMENTARY LAW.

Roberts' Rules of Order shall be the governing parliamentary law of the Section in all cases not definitely provided for by its Constitution or its own rules.

It's the Open Policy that Pays

Candidness and open-minded fairness seem now to be characteristics of our western public service corporation regulation sentiment. Indeed, for getting at the true facts of costs and fair fixing of rates, many of the western corporations are even going the commissioners one better in predetermining a just valuation—a valuation fixed upon such a firm and equitable foundation, no reasonable hearing will ever result in anything but affirmative approval.

The well-defined attitude of the largest hydro-electric enterprise on the coast—the Pacific Gas and Electric Company—may be cited as an instance of this newer and higher ethical development in corporation life. A corporation setting out with the avowed purpose of studying how to increase efficiency to the highest degree and how to scientifically fix just and absolute rates at all points of its great system, and, then, with this data in hand, as easily read as an open book, proposing to stand ready for any investigation, not only puts itself in the most favorable public light, but materially aids in increasing the efficiency of our nation. A careful compilation of cost data concerning hitherto unknown hydro-electric and steam generating deliveries means advanced methods and more efficient operation for human industries. Electrical energy possesses two unusual negative characteristics—it cannot be frozen and it can never be adulterated. The modern milkman, when delivering under a lax board of supervisors, may continue to whiten up his liquid supply, and Mrs. Wiggs, when company arrives, may continue to add a little more water to the soup, but although the modern long-distance transmission of electrical energy may resemble in one particular the proverbial lump of boarding-house butter, in which a little bit is said to go a long way, yet when electrical energy is applied this unadulterated gift of nature,—the captive power of the waterfall—is delivered in its prestine purity.

Journal of Electricity, Power and Gas.

"Pacific Service" booth at Concord Fair

"Pacific Service" at the Walnut Carnival

"Pacific Service" came out strong, as usual, in the Walnut Carnival held at Concord, in Contra Costa County, during the second week in October.

The Company received the first premium award for the best arranged exhibit of manufactured products. The exhibit consisted of various electrical appliances, including percolators, electric irons, toasters, vacuum cleaners, soldering irons, sewing-machine motors, etc. At the end of one booth was erected a fully equipped electric kitchen, presided over by Mrs. Withers, who prepared, cooked and served walnut wafers. Of these District Manager Don Ray states: "They were very delicious, and seemed to make a hit with everybody who sampled them." A second booth was equipped with a table upon which the various appliances were exhibited. On the floor was a rug upon which was demonstrated the efficiency of the electrically operated vacuum cleaner. In a third booth was a miniature irrigating plant which attracted as much attention as any other feature made by any other exhibitor. This plant was operated almost continuously during the carnival. There was also in this booth an electrically operated incubator, also an electric brooder in which were a dozen small chickens. Manager Ray writes:

"The chicks seemed to enjoy themselves immensely, and the fact that there were no fatalities among them during the carnival was voted an excellent testimonial to the efficiency of electricity in such work."

Another feature of the carnival was a contour map of Central Contra Costa County, made of plaster of paris, on which were planted miniature poles and lines showing the distributing system of the Pacific Gas and Electric Company. This map was the exhibit of the Walnut Creek Business Men's Association. It is to be exhibited in San Francisco soon.

* * *

News From the Industrial Department

By JOHN B. REDD, Industrial Fuel Engineer.

J. B. Redd

Within the past eighteen months fifty-six large bake ovens of the furnace and Dutch type have been equipped with the Johnson Blast Gas-Burner, displacing wood and oil as fuel. An average of 30,000 cubic feet of gas is required per month for heating an oven, or a total monthly gas consumption from the burners now installed of 1,680,000 cubic feet.

The Illinois Pacific Glass Company, Fifteenth and Folsom Streets, has recently installed a 10-horsepower automatic gas-fired steam boiler. This is in addition to a 15-horsepower gas-boiler which is in operation and has been for several months. A set of special gas burners have also been in operation about one year for heating the glass moulds. These moulds, after being heated for the day's work, are kept hot by the continued pouring of melted glass. Much time is saved by the use of gas as the moulds are heated while in position, whereas before gas was adopted it was necessary to place the moulds in the large glass furnaces and while hot put them back in position. From 500,000 to 600,000 cubic feet of gas in the average consumption per month from this installation.

Six of the city fire engines have been equipped with special gas-burners for keeping up steam in the engines twenty-four hours per day. These burners have been on trial for two months, and after being in actual use for that length of time have proven entirely satisfactory. It is only a question of approval by the City authorities before the other thirty-nine fire engines will be heated by the use of gas-burners while in the fire houses. A three-light intermediate meter for use for each burner has been installed, and careful records show the average gas consumption to be 750 cubic feet per burner per day, which is a saving of about 50 per cent over the cost and operation of the old coal-heaters.

The United Railroads of San Francisco has recently made the following changes in their shops at Geneva and San Jose Avenues:

Two 1000-pound Babbitt melting furnaces converted from coal to gas fuel;

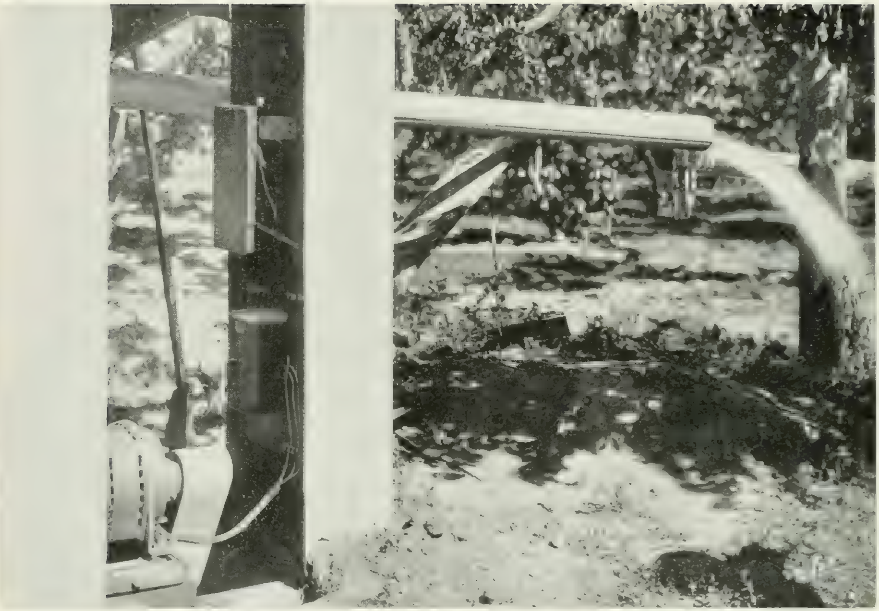
One 4 x 4 x 8 core oven from wood to gas;

Two special machines from gasoline to gas;

Installed 12 new Improved Appliance gas soldering furnaces;

Installed 8 Vulcan soft metal melting furnaces.

All these appliances and burners are giving satisfaction, and the Master Mechanic is greatly pleased over the change from other fuel to gas, as the efficiency of the entire shop is higher on account of the gas being ready at all times, so that a hot fire may be had.



Electric pump at work on a farm in Sutter County

Features of Irrigation and Reclamation

By J. E. POINGDESTRE, Manager Marysville District.

J. E. Poingdestre

The pump is proving to be one of the greatest civilizers of modern times. The early California farmer planted his seed and then waited for the rains to descend and nature to do the rest. If the season was favorable his crops were good, and prices possibly low. If the elements did not favor him, prices might rise in obedience to the law of supply and demand, but crops would be short. The modern farmer does not have to depend upon descending rains but irrigates his crops by lifting the water to them.

Under the floors of the large valleys are large reservoirs holding the rain water away from evaporation by the sun, ready for man's use. He has but to raise the water a short distance and water the growing vegetable life at will. The early farmer was more dependent upon the elements, having a good crop one year and a flood the next. Now, the farming land is diked, and when once flooded the water is quickly drained off by pumping, or, if the land needs water, the farmer has to pump it but a few feet from the river onto the land.

So the pump has acted as a great civilizer, building up small farms and homes where desert or dry plain existed before. The electrically driven pump is the best for the purpose because the electric motor is easy to install and simple to operate, and electric current is supplied where the pumping is to be done, regardless of location.

The Pacific Gas and Electric Company has made an especially low rate for power for irrigation purposes. Formerly the horse was the motive power used in farming, today a motive power that is sound and strong and guaranteed to do the complete work of a horse twenty-four hours a day and no trouble for feed or keep is a big thing with a farmer. Irrigation is not confined to short seasons. It is found that for some crops thorough flooding through the season spreads the work over a longer period and insures larger crops. The amount of water needed for irrigating different crops will depend upon the location and the amount of rainfall, but with a little experience in any locality this quantity can be easily determined. For instance, in the large valleys of California the minimum depth to which water should be supplied to the land is for:

Alfalfa	10 inches
Sugar beets and corn	15 "
Grapes	15 "
Deciduous fruit	15 "

If the irrigation is to be carried on during the dry months, from February to August, the water to be delivered each hour per acre throughout six months, would be for:

Alfalfa	227 gals. per hour
Sugar beets	114 " " "
Grapes	114 " " "
Deciduous fruit	114 " " "

From this the size of the pump and the actual cost when rate of current is known may be readily calculated.

In California, water is used economically, with few exceptions. In 1906 some alfalfa raisers under the Stony Creek Canal near Orland, used from 5 to 15 feet in depth on gravelly soil. When water was first used in Modesto Irrigation District in 1904, the diversion from the Tuolumne in that year was sufficient to cover the area irrigated to a

depth of 13 feet. Under the Turlock District in the same year the use was 8.3 feet deep. Both Districts now use far less water.

In Imperial Valley the use of water under the various mutual water companies averages about two feet in depth. The small quantity is chiefly due to the fact that payments for water are made on the basis of the measure of volume received.

Wherever water is pumped the amount used is small, as a rule. Under a large pumping plant at Lindsay in Tulare County, the average use for several years has been 16 inches in depth. The average use under sixty pumping plants in Santa Clara Valley in 1904 was 13 inches in depth. In the vicinity of Pomona in 1905 the average use was 9 inches for citrus fruits, and 28 inches for alfalfa. In Sutter County under about eighty pumping plants the average use is about 2 feet in depth.

The equivalents of the various units are given below:

1 acre foot equals 43,560 cubic feet.

1 acre foot equals 325,850 gallons.

1 cubic foot per second equals 450 gallons per minute.

1 cubic foot per second equals 1 acre-foot in 12 hours.

1 cubic foot per second equals 2 acre-feet per day.

1 cubic foot per second equals 40 miner's inches under 6 inch pressure.

1 cubic foot per second equals 1 acre-inch per hour.

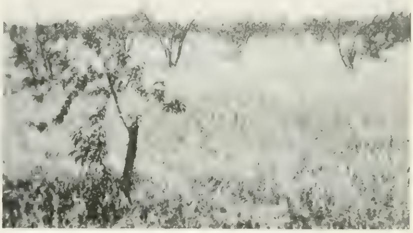
The centrifugal pump is generally best adapted to irrigation purposes in connection with an electric motor. The speed is high, so that the pump can be readily belted to a moderately high-speed motor or, better still, may be direct-coupled to it. The centrifugal pump is essentially adapted for large volumes and low head.

The following table, which is taken from one of the leading pump manufacturers, will give an idea of the speed required in different sizes of pumps to pump up above levels:

Standard Horizontal Pumps Fig. [illegible]	Diameter of Runner Inches	FEET HEAD														
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
		REVOLUTIONS PER MINUTE														
¾"	5	900	1280	1560	1800	2000	2200	2300	2500							
	6	750	1070	1305	1500	1671	1840	1920	2080	2200	2320	2400	2520			
1", 1½"	8	560	800	970	1130	1254	1380	1440	1560	1650	1740	1800	1890	1980	2025	2100
2"	9	500	720	870	1000	1114	1228	1280	1380	1466	1546	1600	1680	1760	1800	1864
2½"	10	450	640	780	900	1000	1100	1160	1250	1320	1400	1440	1510	1580	1650	1680
3", 3½", 4"	12	374	535	652	750	835	920	960	1040	1100	1160	1200	1260	1320	1350	1400
5"	14	325	450	555	640	715	780	820	870	940	1000	1033	1075	1135	1160	1200
6"	16	280	400	485	565	627	690	720	780	825	870	900	945	990	1012	1050
7", 8"	18	250	360	435	500	557	613	640	680	733	773	800	840	880	900	932
10"	20	225	320	390	445	500	550	575	625	655	700	720	755	790	825	840
	21	215	300	373	425	480	525	550	580	625	650	685	725	755	785	810
12"	24	187	267	325	376	418	460	480	520	550	580	600	630	660	675	700

The total head as used in the above table is the sum of the suction-lift, discharge-lift and friction-head occasioned by the pipe lines, and elbows—thus, if the suction-lift be 25 feet, the discharge-lift 10 feet and the friction-head 2 feet, the total head will be 37 feet. The amount of power consumed will vary as the head, but the following table will give an idea of the capacities of the different centrifugal pumps when pumping at their extreme head, and the size of motor required.

Five-horsepower, 3-inch pump at work



Orchard dying for want of water

Pump on Jos. Peter's farm

C. G. Best uses 5-horsepower, 3-inch pump

Pump on M. J. Newkom's farm

The Result of Irrigation

Size of Pump Inches	Average Capacity Gpm.	Size of Motor	Maximum Head at 1700 Rpm.	Maximum Head at 1120 Rpm.	Maximum Head at 850 Rpm.	Price of Pump on Extended Base Exclusive of Motors
1 ″	25	1	45′	. .	. .	$ 65.00
1½″	50	2	45′	. .	. .	90.00
2 ″	100	3	60′	. .	. .	105.00
2½″	150	5	65′	. .	. .	144.00
3 ″	250	7.5	65′	. .	. .	165.00
3½″	300	10	70′	. .	. .	185.00
4 ″	400	15	75′	. .	. .	205.00
5 ″	700	20	. .	70′	. .	245.00
6 ″	900	30	. .	75′	. .	300.00
7 ″	1200	40	. .	85′	. .	345.00
8 ″	1600	50	. .	. .	80′	450.00
10 ″	3000	100	. .	. .	85′	625.00
12 ″	4500	150	. .	. .	85′	800.00

The pumps vary in size from 1 horsepower to 100 horsepower. From 7½ to 10 horsepower is a very popular size where small tracts are irrigated. Where some sections cover larger tracts a 50 and 100 horsepower are commonly used. On account of the wide distribution given to power circuits the alternating 3-phase current is most commonly used. The voltage is 220, 440 or, in larger sizes, 2,200 volt. The General Electric Company makes a standard 2,200 Volt Motor as small as 15 horsepower. Automatic control can be installed enabling the Operator to start and stop the motor and pump from a distance. Float switches and pressure regulators are also used to automatically start and stop the pump.

Irrigation in Sutter County

Pumping for irrigation driven by Electric Motors was first started in Sutter County in the year 1911 and proved a great success when about 200 horsepower was installed. This year over 800 horsepower additional will be installed, and it is safe to say that this will be doubled next year, as the land is rapidly being subdivided in Sutter and Yuba Counties.

The Electric Motors can be supplied to all classes of farm and dairy machinery. Also every building and residence can be provided with electric current for lighting and appliance purposes, and which is being specially developed.

The following safe, clear and practicable devices for this class of work are as follows:

- Electric Stoves and Ranges
- Tea Kettles
- Soup Kettles
- Coffee Percolator
- Tea Urn
- Chafing Dish
- Cereal Cooker
- Radiant Toaster
- Luminous Radiator
- Water Heater
- Coffee Grinder
- Meat Grinder
- Bread Mixer
- Ice Cream Freezer
- Sewing Machine Outfits
- Vacuum Cleaners
- Washing Machine
- Fan Motors
- Electric Irons
- Centrifugal Dryers

As the necessary wiring for a lighting system can be easily installed and as many of these electric household devices require but a small amount of current, they can be connected to the lighting circuits.

The load has increased so much of late in Sutter County that the voltage is now being changed from 2,300 to 11,000, which when completed will give continuous and perfect service. About 14 miles of new lines are being run in District 10 in Yuba County to supply in the neighborhood of four to five hundred horsepower for this year and next. The campaign started last year for electric driven pumps in the Marysville District is now bearing good fruit and will from now on be a very large factor in increasing the earnings of the Company, and at the same time be of inestimable benefit to the Farmer, who is beginning to realize the great advantages to be derived from the use of electricity on the farm.

Accompanying this article are a few typical illustrations of pumping installations in Sutter County.

A Grounding and Shorting Device

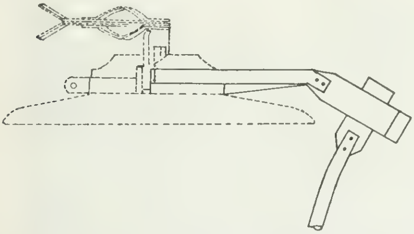
By G. A. HAUSSLER, Foreman, Colgate Power Division.

G. A. Haussler

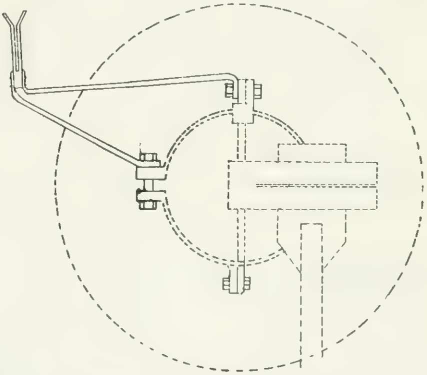
The Pacific Gas and Electric Company from time to time has devised various types of "grounding" and "shorting" switches and installed them on the 60 kilovolt system.

A grounding and shorting device is intended to afford protection to the workmen. By its use it shows conclusively whether power is still on the wires when it is supposed to have been taken off, and it also serves to remove the "static" from the wires.

All of the types consist of a horizontal shaft to which are attached switch arms, all mounted below a cross-arm and capable of being rotated by means of levers and bell cranks. The essential difference between the various types is in the contact on the end of the switch arms to the parts normally "hot."



For instance, in one type the switch arm was split, making the end "forked." When thrown in this contact straddled the line wire and so performed its work. In another type, the end of the switch arm was a flat metal surface, which when thrown in was pressed against a metal bracket mounted, usually, on one of the air switch insulators.



The accompanying sketches will give a fair idea of the grounding and shorting device recently installed at Colgate on the three Bay lines, the operation of which is practically the same as those mentioned above. A bracket, to which a regular switch jaw is fastened, is mounted on the clamps, on one of the main line switches, and when put into service guarantees a good and reliable contact with the ground.

Noting Progress of the World's Fair

During the past month two states and one foreign country have been added to the list of announced participants in the Panama-Pacific Exposition that have picked out the ground on which their buildings will be erected.

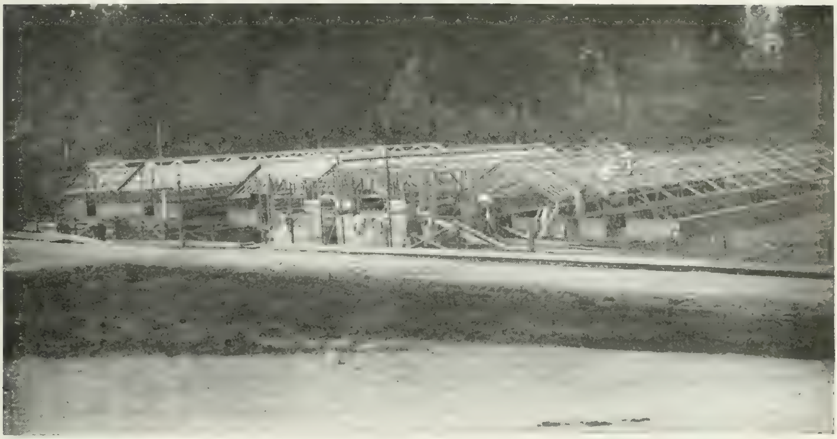
Ohio selected her site October 10th, Governor Judson Harmon coming to San Francisco in person to perform the ceremony. All San Francisco turned out to greet Governor Harmon and gave him cordial welcome. At the dedication ceremonies the distinguished visitor spoke words of more than encouragement to the people of the city by the Golden Gate.

"At the present time," he said "the greater part of the commerce of the country is carried on the great lakes, but we realize the time will come when San Francisco will be the greatest port in the country. And we realize that the canal will cut more than a commercial line across the Isthmus. We have overcome our section differences between the North and the South, but who knows but that the estrangement between the great West and the great East might some day have become serious—I have seen signs of it myself—if this canal had not been dug to unite us?"

Another Governor came to San Francisco during the month on a similar mission. This time it was Governor Thomas Marshall of Indiana, at that time candidate of the democratic party for the office of Vice-President of the United States to which he was triumphantly elected on the 5th day of the present month. Governor Marshall made a great hit with the people of San Francisco, and although the weather was far from propitious his bright, cheery nature worked its charm upon the assembled multitude at the dedication ceremonies, and there arose an enthusiastic cheering as he planted Indiana's flag in a little mound of earth on the Exposition ground and thus formally selected the site for Indiana's exhibit. These ceremonies took place October 22nd.

Two days later the new republic of China planted its five-barred flag of red, yellow, blue, white and black upon the site of its national exhibit. The attendant ceremonies at-

Lumber for the Service Building



Greenhouses and Potting house in Construction

tracted an enormous crowd that filled the grand stand and overflowed on all sides. The flag of the new republic was planted by Dr. Chin-Tao Chen, former Minister of Finance of China and now Chinese Commissioner-General to the Exposition. The Chinese are not as spectacular as they were before they cut their hair and adopted European clothing. But they are just as fond of noise, and an explosion of firecrackers accompanied the military salute from the artillery.

The million dollar auditorium provided for in the Exposition budget will be erected in the block bounded by Hayes, Larkin, Polk and Grove streets, on the site of the old Mechanics' Pavilion. The city paid $701,437.08 for the site, Mayor Rolph presenting a warrant for that amount to President Taussig of the Mechanics' Institute in the presence of the officials of the Exhibition. Plans are being drawn for a magnificent structure, and every effort will be made to complete it before 1915.

The Buildings and Grounds Committee of the Exposition has advertised for bids for the grading of the foundation of the Machinery Building and for the construction of the Court of Honor and the Festival Court. The Director of Works has been instructed to advertise for teams, scrapers, wagons, plows, and other necessary implements to be used in the construction of all the gardens and courts on the Harbor View site.

Word comes from Washington that Postmaster-General Hitchcock has directed that 80,000,000 one-cent, 150,000,000 two-cent, 8,000,000 five-cent and 5,000,000 ten-cent Panama-Pacific International Exposition postage stamps be prepared and placed on sale in the Post offices, beginning January 1st, 1913. The stamps are about three-fourths of an inch high by one and a sixteenth-inch wide. At the top appear the words: "U. S. Postage," and "San Francisco, 1915."

The one-cent stamp is green. In the center appears within a circle a bust of Balboa, discoverer of the Pacific Ocean.

The two-cent stamp is red. It represents the tatun marks of the Panama Canal.

The five-cent stamp is blue and represents the Golden Gate of San Francisco.

The ten-cent stamp is dark yellow. The subject is "The Discovery of San Francisco Bay."

These will soon be in circulation.

Pacific Gas and Electric Magazine

PUBLISHED IN THE INTEREST OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON - - - - EDITOR-IN-CHIEF
FREDERICK S. MYRTLE - - MANAGING EDITOR
A. F. HOCKENBEAMER - - BUSINESS MANAGER

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VOL. IV NOVEMBER, 1912 No. 6

EDITORIAL

THE PACIFIC GAS AND ELECTRIC COMPANY has issued to its stockholders a comprehensive report of its business for the year 1911. This report, printed in pamphlet form, speaks volumes for the part played by "Pacific Service" in the development of the natural resources of California.

It is at this particular time of the year, when the rivers are at their lowest, that a great deal of attention is paid to irrigation. The whole States cries for water, and where Nature withholds her hand man's skill must devise a means of supplying the deficiency. In view of this it is interesting to note, first, that immense additions to the company's water storage systems are in process of actual construction, second, that during the year 1911 the company contracted for 13,592 horsepower in new busines to be used entirely for industrial and agricultural purposes. Vice-President and General Manager John A. Britton in his report states:

"The particular activity of the Company to which special attention might at this time be called has been the development during the year 1911 of the uses of electric energy for irrigation purposes. There exists within the territory of the Company susceptible of irrigation over 12,000,000 acres of land which, when irrigated, will be capable of supporting a population of at least 2,000,000 people and of raising any of the cereals and fruits which have made California famous. Through a corps of trained solicitors in the Commercial Department we are educating the farmers to the advantages of irrigation and are rapidly extending our field in this direction."

Under the head of expenditures for additions, improvements, and betterments, exclusive of moneys expended in the acquisition of other properties, it appears that a sum of $3,679,791.19 was paid out as follows: Additions to the gas generating plants and distribution systems, $1,178,390.35; high tension line extensions and equipments of substations, inclusive of transformers and meters, $301,524.68; electric distribution systems, inclusive of underground installations, $751,203.76; purchase of lands and rights of way, $182,303.82; new reservoirs and pipe lines, $75,347.76; extensions and betterments of street railway system at Sacramento, $46,411.42; additions to steam plants in San Francisco, Oakland and Sacramento, $817,373.87; additions to distribution system of the Stockton Water District, $23,490.04; steam heating systems, $176,228.00; workshop at Sacramento, $7,208.86; automobiles and transportations, $53,044.36; additions to furniture and fixtures and other equipment, $67,264.27.

From the report of Second Vice-President and Treasurer A. F. Hockenbeamer we learn that the company's gross revenue in 1911 was $14,604,609.30, from which must be deducted $1,398,404.03 for maintenance, $6,815,667.94 for operating expenses, taxes and reserves, $3,254,133.27 for interest, $1,448,898.38 for dividends on preferred stock, sinking fund, and amortization of bond discount and expense; leaving a net balance of $1,687,505.68 on the credit side of the company's balance sheet. Mr. Hockenbeamer states:

"Fifty-four per cent of the gross revenue of 1911 was derived from the sale of electricity, 40 per cent from the sale of gas and 6 per cent from water sales and street railway operation. Compared with 1910 the gross revenue increased $560,013.19 and charges for maintenance, operation, taxes, etc., increased $292,730.97, leaving an increase in the net revenue available for bond interest of $267,282.42. Through the operation of the new State law, which went into effect April 1, 1911, and under which we are required to pay into the State Treasury 4 per cent of our gross receipts from operation of gas, electric and street railway properties in lieu of all taxes, State, county and municipal, on such properties theretofore assessed on an ad valorem basis, our taxes during the State's fiscal year, from July 1, 1911, to July 1, 1912, were increased $267,644.06, of which increase one-half, or $133,822.03, appears in the above statement for the company's fiscal year 1911."

This surely is a creditable showing and one which should add materially to the now rapidly growing confidence in public utility securities for investment purposes. We note that the London press is paying considerable attention to the situation in the West at the present time. The London "Financier and Bullionist" has this to say on the subject:

"An interesting and significant comparison is made by a well-known financial house between public utility securities and those of railroad and industrial companies, from which it is evident that the former not only give a higher yield to the investor but are less sensitive to financial upheavals and better situated as regards surplus or reserves than the average railroad or industrial company. The three essentials entering into the composition of desirable investments are, of course, (a) security of capital, (b) stability of income, and (c) marketability of the security. Tables are given by the firm in question showing in comparative form gross and net earnings, the proportion required for interest and dividends and the surplus above these requirements. The tables contain also figures relating to the value of equities behind the various securities considered, thus indicating the reliability of interest returns and the degree of security or margin of safety which protects the principal of an investment. The individual securities and companies dealt with in the tables are typical of their respective groups, favored among investors and commanding a ready market. Briefly, the analysis brings out prominently the irregular and uncertain recovery in railroad and industrial earnings, following the 1907 panic, and the steady increase in public utility earnings during the same period. Further, it shows in no uncertain fashion the higher income yield held out by public utility securities and the greater surplus of the earnings above interest and dividend requirements on the public utility stocks and bonds. In other words, public utility companies possess elements which produce a larger and more secure income and a greater degree of stability for capital invested than can be claimed for either American rails or Industrials."

That "Pacific Service" has attracted the attention of our friends across the water is evident from an article in the same publication on consolidation of interests in the power-producing industry on the American continent. We quote the following:

"California is another State where the same tendency toward concentration is evident. The Pacific Gas and Electric Company of San Francisco operates over perhaps one-third the area of the State. Much of its energy is derived from water-power, but it has also a number of steam-generating stations. Gas is piped for considerable distances under high pressure in much the same way that electricity is transmitted at high voltages."

So we are marching onwards. In an age of unusual progress "Pacific Service" deservedly takes place in the front rank of the forces of progressive enterprise.

ITEMS OF GENERAL INTEREST

Vice-President and General Manager John A. Britton left for the East, November 3d, to attend the conference of State and National authorities on water-power lands conservation to be held at Washington on the 15th instant. As is generally known, this conference was called by the Secretary of the Interior for the purpose of framing State and National Legislation looking toward conservation within proper lines.

Mr. Britton is booked for illustrated lectures on the electric power development of California in the cities of Chicago and New York. He is expected to have some interesting matters to relate upon his return.

Mr. E. C. Jones is back from the convention of the American Gas Institute at Atlantic City, bearing with him the glad intelligence that the Institute will hold its 1915 convention in San Francisco.

Mr. Jones attended the convention both as a delegate from the Pacific Coast Gas Association and as the official representative of the Panama-Pacific Exposition. He had no sooner arrived at the convention city than with his usual activity he plunged in *medias res*. He encountered some opposition on the part of members of the convention who feared a somewhat sparse attendance should the convention be held on the Pacific Coast, but in the end Mr. Jones' indomitable energy and enthusiasm won the day, and the resolution sought for was adopted with but one dissenting vote. To quote from Mr. Jones' official report upon his return:

"My mission was entirely successful. Through the kindness of the officials of the Panama-Pacific Exposition Company I was enabled to furnish buttons to the Eastern gas men, and mainly owing to the valuable assistance of my friends among them the resolution to hold the 1915 convention in San Francisco was carried with only one dissenting voice.

"It was decided to hold the meeting of the Institute in San Francisco during the week beginning Monday, September 27th, 1915, and the following committee was appointed to act in conjunction with the committee of the Pacific Coast Gas Association in the matter:

Chairman, the President of the American Gas Institute;

Secretary, the Secretary of the American Gas Institute;

(These are *ex-officio.*)

Mr. W. R. Addicks, of New York, Chairman for 1913;

Mr. George D. Ramsdell, Secretary;
Mr. John A. Britton, San Francisco;
Mr. Walton Clark, Philadelphia;
Mr. E. G. Cowdery, Chicago;
Mr. C. L. Holman, St. Louis;
Mr. R. M. Searle, New York; and
Mr. W. A. Wood, Boston."

Mr. Stanley V. Walton, Manager of our Commercial Department, has just returned from a four-weeks' trip through the East, where he represented not only "Pacific Service" but, also, the Electrical Development League of San Francisco, the California Development Board and the Sacramento Valley Development Association at various meetings.

His first stopping place was Salt Lake City, where he attended the Twentieth Annual Session of the National Irrigation Congress as a delegate from the California Development Board and the Sacramento Valley Development Association. He next attended in Boston the meeting of the Executive Committee of the Commercial Section of the National Electric Light Association. Mr. Walton is the only member of the Executive Committee west of Chicago. Of particular importance to us was the appointment of three committees on Electricity on the Farm, Eastern, Middle and Western States, respectively. The Western Section is made up of:

S. V. Walton, Chairman; S. M. Kennedy, Los Angeles; S. B. Walthall, Fresno; H. S. Wells, Portland; C. H. Williams, Denver; E. P. Edwards, Schenectady; H. W. Cope, Pittsburg. This committee will collect the data and publish a handbook on electricity on the farm as applied to Western conditions.

Mr. Walton also attended the Boston Electric Show as a delegate from the Electric Development League of San Francisco, and reports the show was a great success from every point of view.

In New York Mr. Walton spent considerable time with representatives of N. W. Halsey & Co. and Harris Forbes and Company, and reports a very lively interest in all California securities, especially those of the Pacific Gas and Electric Company.

In Washington he had a conference with Dr. A. C. True, Director of the Office of Experiment Stations under the Department of Agriculture, Dr. Samuel Fortier, Chief of Irrigation Investigations, and Frank Adams, Engineer in charge of Irrigation Investigations on the Pacific Coast, where matters of interest in connection with the agricultural development of our 38,000 square miles of territory were discussed.

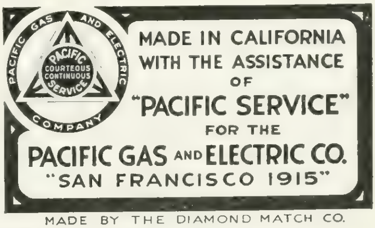
Other places of interest visited by Mr. Walton were Schenectady, Pittsburg, Wilmington, Chicago, St. Louis and Denver.

Mr. Walton says that everybody he met was interested in California, especially San Francisco, and that every one down to the office boy was saving money to come to California in 1915. "Pacific Service" must be ready to supply the demands that will be made on it at that time.

Our Company has recently expended some $18,000.00 in the construction of a new double-circuit line from Martin Station to South San Francisco for the purpose of accommodating the manufacturing industries of the latter section. Concerning this, Mr. H. P. Pitts, our Industrial Engineer, has this to say:

"It was desired that the manufacturing industries of South San Francisco should receive the same service as enjoyed by our consumers in the great city nearby, that is, that they should be assured of uninterrupted service by being placed in direct connection with our steam generating station."

"Pacific Service" supplies electric energy to the Diamond Match Company, whose immense works are situated near Chico, and which, in turn, supplies the Pacific Gas and Electric Company with all its matches used at headquarters and elsewhere in the large territory covered by its operations. The manufacturing company has executed the accompanying special design which is to appear on every match-box turned out for the use of "Pacific Service":



MADE IN CALIFORNIA
WITH THE ASSISTANCE
OF
"PACIFIC SERVICE"
FOR THE
PACIFIC GAS AND ELECTRIC CO.
"SAN FRANCISCO 1915"

MADE BY THE DIAMOND MATCH CO.

Mr. W. T. Pease, our energetic chief of the Gas Arc Department, is very successful with his Friday night meetings. These are invariably well attended, and the papers read and the discussions had upon them show that the men of this department are enthusiastic members of "Pacific Service."

The meeting of October 18th will serve as an illustration of what these meetings are like. There was an attendance of over 60 persons, including women attached to the department. An excellent paper on "Service and House Line Complaint Work" was presented by Mr. A. J. Diel of the Installing Department. In this the installer was advised to investigate meter conditions before turning on lamps, in order that the consumer might get the best possible benefit from the installation.

"Efficiency as applied to the Gas Arc Department" was the subject of a paper by Mr. C. L. McIlvaine, assistant manager of the department, who dwelt strongly upon desire to serve, development of personal qualities, co-operation and courtesy as essential attributes of efficiency. Mr. McIlvaine gave special advice, in turn, to his office force, inspection and maintenance men, and the intalling and sales departments.

Then came the department manager himself with a paper on "Straight Talks to Salesmen." In this he earnestly advocated scrupulous and unswerving honesty, promptness and punctuality, willingness to work, politeness and cheerfulness, confidence, neatness and thoroughness.

Weekly reports upon the business of the department are presented at these meetings, and it is of record that each successive report up to the present has shown an increase in efficiency.

Mr. W. M. Henderson, our capable district manager at Fresno, has been transferred to San Francisco, where he takes the position of Assistant Gas Engineer under Mr. E. C. Jones. His place in the raisin district has been filled by the appointment of Mr. M. L. Neely, a young man who has achieved a great reputation as a Gas Engineer in the East.

From the President's office comes the announcement that Mr. Paul M. Downing, as Engineer of Operation and Maintenance, is placed in full charge of the Nevada and Placer Water Districts. This order, however, does not affect either Mr. Geo. Scarfe or Mr. H. M. Cooper, who will remain managers of their respective districts as before.

The following organization is officially announced, applying to the Lake Spaulding, Bear River and Drum Power-House Development:

ENGINEERING:

F. G. Baum, Chief Engineer and General Superintendent.

P. M. Downing, Assistant Chief Engineer and General Superintendent.

H. C. Vensano, Civil Engineer.

J. P. Jollyman, Electrical Engineer.

R. G. Clifford, Resident Engineer, Division No. 1.

G. C. Noble, Resident Engineer, Divisions No. 2 and No. 3.

P. E. Magerstadt, Resident Engineer, Division No. 4.

SUPERVISION:

D. H. Duncanson, Superintendent, Divisions No. 1 and No. 4.

James Martin, Superintendent, Divisions No. 2 and No. 3.

E. H. Steele, Superintendent, Line Division.

Division No. 1 includes the Spaulding Dam, tunnel and canal to Emigrant Gap road crossing. Division No. 2 includes remainder of canal, the Forebay and Power-House.

Divisions No. 3 and No. 4 cover the Bear River Canal enlargement, Division No. 3 from the intake to the road crossing near the 11½-mile post, and Division No. 4 the remainder of the canal to its connection with the Boardman Canal.

The engineers are responsible for all plans, specifications, construction, lines, grades, etc., and general methods of handling the work.

The superintendents are responsible for all matters relating to the actual construction, having full control of the construction, force, equipment, etc.

What the Press Has to Say

Big Doings in Marin

Company Spending Large Sums in Improving the Electric Service to San Rafael

The Pacific Gas and Electric Company has recently entered into some very important construction work that when completed will insure vast improvement of the Company's electric service, not only in San Rafael but throughout the entire county of Marin.

A new line has been started to run from the Company's sub-station at Cordelia above Vallejo through San Rafael to Schuetzen Park, a distance of 34½ miles. The purpose of this is to supply the main feeder and insure permanent and uninterrupted service to the consumers of electricity for all purposes, domestic, commercial, industrial, etc. Through this addition to the company's equipment the electric lines not only will be less subject to mishap from accident, stress of weather or other causes, but they will have a far larger carrying capacity than at the present time.

Plans and estimates have been approved and the work is actually started. The new line is to be of the most modern equipment and will be a steel tower line throughout. It will take about two hundred of these towers to support the wires that will carry the mysterious "juice" through the center of Marin county to the rapidly increasing army of consumers of "Pacific Service." The standard towers will be 78 feet in height, but besides these there will be needed a considerable number of higher ones ranging between 175 and 200 feet in height for the purpose of crossing the various creeks and sloughs that lie between Cordelia and San Rafael. These include the Petaluma, Napa and Sonoma Creeks and the other intervening water ways from the San Francisco bay.

The work of preparing the foundations for the pole line through these sloughs is already under way. The contract has been let to the Duncanson-Harrelson Company of San Francisco, and any day now a gang of men can be seen driving poles near the mouth of Sonoma Creek. This really looks like business and the news will afford great satisfaction to the Pacific Gas and Electric Company's consumers of electricity in Marin county.

The Company having completed its arrangements will lose no time in carrying this very important work to a conclusion, and the latest reports from the engineers indicate that the service may be completed this fall. That depends of course upon the prompt delivery of the material contracted for. It is a difficult piece of construction work, as any one familiar with the lay of the country along the proposed pole line can see for himself, but modern science can accomplish the almost impossible, and it is safe to say that ere very many months have elapsed consumers of "Pacific Service" in Marin county will be enjoying the best electric service that human ingenuity and endeavor can provide.

The total cost to the Company for this construction work will be in the neighborhood of $350,000.

Marin Journal, Oct. 10, 1912.

Improvements at Woodland

The Pacific Gas and Electric Cmpany has authorized an expenditure of $59,098 for new gas works on the lot just east of town, where the company is at present constructing a new sub-station. This is made necessary owing to the fact that the present equipment is inadequate to supply the demand, and being located on the main street, near the business center, it is deemed advisable to move the plant out where there could be no possible objection to its location.

Eleven years ago, when the company purchased the plant, an entirely new equipment was installed. Business has so increased as to make the present plant inadequate. With the construction of the proposed new plant all the present equipment except one boiler and possibly one gas generating set will be junked.

One of the main features of the new plant will be a gas holder with a capacity of 100,000 cubic feet. The new gas holder will give the company a reserve supply that makes it practically impossible for the city ever to have a gas famine. The new gas holder will alone cost $15,000. The rest of the plant will be thoroughly equipped with all the latest and improved machinery for gas making and will be first-class in every particular.

The company is to be commended for its efforts to keep pace with the rapid progress of the community, and particularly for removing the plant to a location where there could be no possible objection.

E. C. Jones, chief engineer of the gas department, and Sherwood Grover, assistant gas engineer, were in this city Thursday looking over the ground. Resident Manager W. E. Osborn was out of the city and did not see them, and is therefore not prepared to state just when the actual construction of the new plant will begin, but he has the assurance that it will be as soon as possible.

Woodland (Cal.) *Democrat*, Sept. 13, 1912.

A Good Financial Showing

Press Comments upon Company's Statement of Earnings for the Past Eight Months

Earnings statement of the Pacific Gas and Electric Company for the eight months ended August 31, 1912, is as follows:

Gross earnings	$9,694,841
Operating expenses, including taxes and maintenance	5,464,755
Net earnings	$4,230,086
Bond interest paid	2,319,118
Balance	$1,910,968

After taking out preferred and common stock dividends, a surplus of about $846,704 will remain, available for depreciation and other purposes.

Owing to the fact that three of the eight months lie in the summer, when the nights are short and the consumption of gas and electricity less, the earnings statement does not quite maintain the ratio established in the statement for the first five months, but the coming winter months will bring up the average. The statement, however, is up to the rumors that have leaked out about it.

At the end of May the surplus was $721,333, so it has built up at the rate of about $42,000 per month for the three months since that time. Taking into consideration the statement of consumers issued Wednesday, the company's showing is a remarkably strong one. It has now practically 300,000 consumers, and during the first six months of 1912 the increase was more than 12,000.

There is $31,998,750 common stock in the hands of the public, on which dividends of 5 per cent are being paid, and $10,000,000 of 6 per cent cumulative preferred stock. The general and refunding 5 per cent bonds issued total $25,000,000, of which $235,000 have been retired by sinking fund requirements. Underlying closed mortgage bonds out-total $51,143,000, and these are being retired by automatic action of sinking funds.

San Francisco (Cal.) *Call*, Sept. 29, 1912.

Pipe-Lines for Fresno

Ten carloads of 16-inch pipe have arrived here from the New Jersey and Alabama factories to be used by the Pacific Gas and Electric Company in relaying its main line from the gas works in Chinatown to Fresno and O Streets. The cars have been unloaded and most of the pipe is now strung along Tulare street. More cars are coming from the East with 16-inch pipe and the estimated cost of the pipe alone for the new main line is $65,000.

Work has been started already on the relaying of the main artery. W. M. Henderson, local manager, stated yesterday that a scarcity of labor existed at the present time and workmen are a luxury. After the close of the fruit-picking season he expects to get plenty of help and for this reason is not worrying over the present situation.

A crew of twenty men is re-laying the 16-inch pipes in Chinatown and the work has been completed as far as G street on Tulare. Just beyond the Southern Pacific tracks the men encountered a tunnel running under Tulare street from the two plants of the Pacific Coast Seeded Raisin Company. This underground passage is sufficiently large to force the crew to go down ten feet deeper than in any other point on the street. The additional excavation will also delay the work for several days.

The big pipes will be put down on Tulare street as far as O, where the main line will turn north and terminate at the intersection of O and Fresno streets. For this work Manager Henderson says he will need the services of at least 120 men during the winter months. Pipes have been strung along Tulare street from M to K and from I to Chinatown and the gas works. The blocks between I and K have been left vacant because of the large amount of traffic on Tulare street between those points.

This week a force of ten men will begin work at Merced and N streets laying 10-inch pipe along N to Nielsen avenue and thence along Nielsen to Forthcamp. This supply of pipe arrived here a few days ago and will be used as principal feeding lines connecting with the main artery on Tulare street. In the residence section the small lines will be re-laid with 5-inch pipes and 10-inch tubes are to be used in the downtown district. Officials of the gas company declare they recognize Tulare street as the main thoroughfare of the city, and for this reason the 16-inch pipes are being put down as far as O street and then north to Fresno, where the 10-inch line will be connected to supply the northern residence section.

Fresno Republican, Sept. 16, 1912.

Gives Lights; No Cost

To the Pacific Gas & Electric Company of which Don C. Ray is the manager for this district which comprises Concord is due much of the credit for the successful carrying out of the street lighting scheme. The company not only offered free "juice" during the carnival but also had its force of electricians and linemen at work placing the lights in position and special men were constantly on hand to see that there was no hitch in the lighting system. The streets were made as bright as day with hundreds of electric bulbs and the whole presented a beautiful effect.

Martinez (Cal.) *Gazette*, Oct. 11, 1912.

Mr. Baum to Take Hold

Friends of F. G. Baum, the well-known engineer, received word yesterday that he would return to this city today after an absence of about three months. He went to Peru in connection with a big-hydro-electric power project, and is coming back by way of New York.

According to a report in electric circles yesterday Baum will devote a good deal of his time on his return to engineering work now in progress by the Pacific Gas and Electric Company. In the past he has been connected with the company in an advisory capacity. He was intimately associated with the late James H. Wise, assistant general manager of the company, who was killed in an automobile explosion last month. Wise was one of the youngest engineers in a responsible position hereabouts.

The construction of the Lake Spaulding dam, reservoir and pipe lines was one of the large undertakings that was occupying Wise's attention. The dam, which will be one of the highest in the world and will require about two years to build, was begun some time ago. The dam is to impound the waters of the South Yuba River. It is figured about 30,000,000,000 gallons will be stored.

S. F. Chronicle, Oct. 5, 1912.

PACIFIC GAS AND ELECTRIC COMPANY

DIRECTORS

F. B. Anderson
Henry E. Bothin
John A. Britton
W. H. Crocker
E. J. De Sabla, Jr.
F. G. Drum
John S. Drum
D. H. Foote
Wm. G. Henshaw
A. F. Hockenbeamer
Samuel Insull
John Martin
C. O. G. Miller
Louis Sloss
George K. Weeks

OFFICERS

F. G. Drum	President	D. H. Foote	Secretary and Asst. Treasurer
John A. Britton	Vice-Pres. and Gen. Mgr.	J. C. Love	Asst. Treasurer
A. F. Hockenbeamer	2d Vice-Pres., Treas. and Comp.	Charles L. Barrett	Asst. Secretary

HEADS OF DEPARTMENTS

M. H. Bridges	Auditor	W. B. Bosley	Attorney
W. H. Kline	General Agent	H. C. Vensano	Civil Engineer
R. J. Cantrell	Property Agent	E. C. Jones	Engr. Gas Dept.
George C. Robb	Supt. of Supplies	H. P. Pitts	Industrial Engineer
J. H. Hunt	Purchasing Agent	S. V. Walton	Manager Commercial Dept.
E. B. Henley	Manager Land Dept.	S. J. Lisberger	Engr. Electric Distribution
J. P. Coghlan	Manager Claims Dept.	Sherwood Grover	Asst. Engr. Gas Department
H. Bostwick	Secretary to President	J. P. Jollyman	Engr. of Electric Construction
F. S. Myrtle	Manager Publicity Dept.	P. M. Downing	Engr. O. & M. Hyd.-Elec. Sect.
L. H. Newbert	Manager Appliance Dept.	C. J. Wilson	Asst. Engr. Electric Distribution
G. C. Holberton	Chief Engineer Stockton Water Dist.	F. H. Varney	Engr. O. & M. Steam & Gas Eng. Sect
F. G. Baum	Chief Engineer Hydro-Electric Department		

DISTRICT MANAGERS

District	Headquarters	Manager	District	Headquarters	Manager
Alameda Co. Berkeley Oakland	Oakland	F. A. Leach, Jr.	Nevada City	Nevada City	John Werry
			Petaluma	Petaluma	H. Weber
			Placer	East Auburn	H. M. Cooper
Antioch	Antioch	F. J. Southerland	Redwood	Redwood City	E. W. Florence
Chico	Chico	H. B. Heryford	Sacramento	Sacramento	C. W. McKillip
Colusa	Colusa	L. H. Hartsock	San Francisco	San Francisco	G. C. Holberton
Contra Costa	Martinez	Don C. Ray	San Jose	San Jose	J. D. Kuster
Fresno	Fresno	M. L. Neely	Santa Rosa	Santa Rosa	M. G. Hall
Grass Valley	Grass Valley	John Werry	Solano	Dixon	C. E. Sedgwick
Marysville	Marysville	J. E. Poingdestre	Stanislaus	Newman	W. A. Widenmann
Marin	San Rafael	W. H. Foster	Vallejo	Vallejo	A. J. Stephens
Napa	Napa	O. E. Clark	Woodland	Woodland	W. E. Osborn

MANAGERS OF WATER DISTRICTS

Colfax (Alta)	Jas. Martin	Placer (East Auburn)	H. M. Cooper
Nevada (Nevada City)	George Scarfe	Standard (Electra)	W. E. Eskew
Stockton (Stockton)	J. W. Hall		

SUPERINTENDENTS OF POWER DIVISIONS

Colgate	Miles Werry	Oakland	William Hughes
De Sabla	I. B. Adams	Sacramento	J. O. Tobey
Electra	W. E. Eskew	San Jose	J. O. Hansen
Marysville	E. C. Johnson	South Tower	A. H. Burnett
Nevada	George Scarfe	Stockton	E. C. Monahan
North Tower	C. D. Clark	Solano	J.W. Coons

SUPERINTENDENTS OF STEAM ELECTRIC STATIONS

H. N. Mosher..............Chief Engr. Station "C," Oakland
C. A. Eastwood, Chief Engr. Station "A," San Francisco
T. E. Fogalsang, Supt. Generating Statn., San Francisco
J. W. Varney.........Supt. of Sub-Stations, San Francisco

SUPERINTENDENTS OF ELECTRIC DISTRIBUTION

Berkeley	J. H. Pape	Redwood	R. C. Bragg
Oakland (Underground)	R. C. Powell	Sacramento	C. R. Gill
Oakland and Alameda (Overhead)	A. U. Brandt	San Francisco	A. R. Thompson
Marin	Chas. Dallerup	San Jose	A. C. Ramstad
Valley District (Chico, Marysville, Woodland and Colusa)	W. F. Blide		

SUPERINTENDENTS OF GAS WORKS

Martin Station	John Mitchell	Sacramento	Edward S. Jones
Oakland	A. C. Beck	San Francisco	Dennis J. Lucey
San Jose	R. H. Hargreaves		

SUPERINTENDENTS OF GAS DISTRIBUTION

Oakland	George Kirk	San Francisco	D. E. Keppelman
Superintendent of Railway Department	N. J. Hullin		

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[5] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[5] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

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Pacific Service Magazine

VOL. IV DECEMBER, 1912 NO. 7

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Pacific Service Magazine

Vol. IV

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Single Copies each 15 cents

I USED TO WANDER O'ER THE EARTH
WITH TROPHIES FOR YOUR STOCKING.
OF TRANSPORTATION THERE WAS DEARTH
AND LIGHT AND HEAT WERE SHOCKING.
I FELL AND FUMBLED IN THE DARK
AND GRAZED MY SHINS AGAINST THE BARK;
BUT RUMBLED ON TOWARDS THE MARK,
WITH CHRISTMAS PRESENTS ROCKING.

BUT NOW, LOOK AT MY SMILING FACE;
NOTE WHAT MY DARING NERVE IS.
IN EASE I FLY FROM PLACE TO PLACE
AT SPEED THAT SHOWS WHAT VERVE IS!
MY FLEETING DEER ARE GONE, ALAS!
BUT ALL THE HOUSES THAT I PASS
ARE 'LECTRIC LIGHTED—OR BY GAS
FROM OUR "**PACIFIC SERVICE**"

PACIFIC SERVICE MAGAZINE

VOL. IV DECEMBER, 1912 No. 7

The Story of Lake Spaulding

By JOHN A BRITTON.

CHAPTER I.

THE GLACIER.

A crushing, grinding, moving thing, God-made, yet inanimate. A searing, marring mass of icy mold, bearing in its onward force, from mountain crag to valley breast, the things of creation; altering the plans of the Maker, yet making new ones; changing river courses and hilly contours.

Thus was the beautiful scenic South Yuba Canyon formed, by the irresistible force of nature.

Deep wounds in the breast of Mother Earth became land-locked lakes; deep scars, our granite-walled canyons; the residuum of chastened rocks, soil to nurture the flora and fauna on the hillsides, and the plains. Giant trees and blossoming shrubs, the grass of the meadows and the wild flowers of the vales sprang up under the husbanding care of the summer sun and the protecting cover of the winter snows.

There are, however, huge masses of wounded boulders of impregnable stone, bearing upon their faces the marks of that crawling thing that moved over them, aeons and aeons ago, and they stand on the hillsides and form the buttresses of the embattled walls cut in twain. As you travel over them your eyes can see the marks left by the flinty feet of the past. "Striations", scientists call them; wounds they are, crying out, and yet they have withstood the blasts of ages, and the sun's heat, the nipping cracking frosts, and the Ice King, and, withal, that crawling, grinding, crushing thing; yet tiny man, with his barbs of steel and thunders of poisonous compounds, will come and rend them in twain.

Marching over the stony barriers that rear their heads on our eastern line, came, not so many decades ago, sunbrowned men, hardened by miles of travel over deserts and plains and hills and rivers, and, following down this "South Yuba, the beautiful," with its streams of silver, and on past the green meadows, and the stately pine, and the brilliant chapparal, to where those little cubes of yellow metal, ground to fineness of flour by the moving, crushing thing, had found lodgement in the alluvial soil. Like ants that overspread carrion, these beings of muscle, bone, and blood laid out their habitations, to live and to die in the lure of the residuum of that inanimate thing.

They builded houses, and they formed settlements, and they became a law unto themselves.

Came then the other following and the red-shirted man, with tilting sombrero and be-pistoled belt, bearded like a pard and full of strange oaths. Came the hurdy-gurdy, and the hell-holes; and that little flattened cube of yellow metal that builds cities and monuments; that molds and mars lives; that christianizes, and degrades; was the golden calf set up to be worshipped.

Then the travelers through the mountains remembered the purling streams they had passed, and they said "let us go to the mountains and capture and fetter those drops of crystal, that they may be our slaves to wrest from the soil its hidden treasures."

And they stopped the flow of the stream, this "South Yuba beautiful," and they builded giant boxes of wood on the side of the granite walls; you can see them there now, in mid-air, like the Gardens of Babylon, covered with lichens, and grass and flowers; and they dug, in imitation of that crushing, inanimate thing, huge scars on the face of the earth; and the stream that erstwhile had bubbled and danced its way to the ocean was harnessed, and was made to bore its way into the heart of Mother Earth to wrest from her her treasures, and to leave her fair face again scarred and disfigured.

CHAPTER II.

THE ENGINEERS.

It is summer in the South Yuba Canyon. The unflecked sky of blue is reflected in lake and stream, the blue of the Sierran Heaven, that for all the long days of our glorious summer is not disturbed by a cloud.

Silence reigns impending and absolute—broken only by the musical ripple of the stream fed by the eternal snows that crown the summit's peaks. The hungry trout leaps to the fly, the lower branches of the trees kiss with gentle touch the passing water, the bear treads his stealthy, silent way, and the deer leaps from rock to rock. Nature is again atune and in synchronous harmony.

From "Grouse Ridge" we can view the myriads of lakes like some diamond setting in a purple crown, and mark the silver ribbons of escape as they wind away, now lost, now found, in and among the giant trees that line their pathway, or coming to a moment's rest in the embrace of some green meadow.

Again it is summer, and the gurgle of the stream and the voice of the trees are drowned in the sound of axe on wood, and steel on steel; and on the south slope of the canyon the iron horse goes snorting on its way east and west, darting in and out of that huge black tunnel hung on the side of the hill which looks for all the world like a gigantic caterpillar.

For man has come again into the home of the "South Yuba, the beautiful," to build now for his fellow man.

From Signal Peak we see more diamonds set in the crown of the Sierras, and as we descend we see men, like the Liliputians in Gulliver, striving, working, to stop up the wounds of that crushing, grinding, inanimate thing; and lakes are formed, and streams are turned, and the natural rocks supplemented. For man has found that the earth will bear riches other than gold, and that the parched soil of the valleys will bear rich tributes of fruit and flowers if laved by the living waters of the hills.

CHAPTER III.

REMINISCENCES.

From Emigrant Gap station there toils up the hill to the summit a coach and six on its way to Nevada City, where the metallurgical furnaces of nature have deposited in cavernous depths more of those yellow metal cubes.

On the box, holding with firm hands the prancing team, sits "Uncle" John Spaulding, known from Auburn to the Summit, and loved by old and young alike. His cheery "Good Morning," called out as he flits by, is always awaited by the residents of the hills. At the summit, before he plunges into "Bear Valley," he halts the team for rest, and to take in the view that he never fails to admire; a beautiful meadow rich in its marvelous carpet of green, with the tall stately pines bordering it on either side; and he knows that in a few moments he will be pulling up at the "Bear Valley Home," a pretentious house seen across the valley, with its tier of wide porches, nestling at the foot of a rocky slope embowered in the forest glades.

"Uncle" John is typical of the old mountain days; huge of bulk, kind of eye and of spirit, gentle when in repose as a mother nursing her babe, in action like a giant awakened from sleep; deep throated his tones. He bends his frame of steel to the brakes as he drives down the tortuous road, the leaders prancing off to the very edge of the precipice as he rounds Horse-Shoe Curve, the while he pulls the wheelers to the pole and with his whip-lash negligently flicks a fly off the ear of the nigh bronco in the lead. Then at the foot of the hill, with cry and yell, and crackle like pistol shots of the long lash, he urges the horses into a wild, final dash, to bring them to a halt at last with one pull on the reins with his strong arms and a gentle "whoa!" to the obedient, loving team.

John Spaulding loved the mountains and valleys, and they loved him. Big, strong, generous, manly, and wholesome he was; and when it was determined to build into the crown of the Sierras another diamond, and to close up one of the wounds which that crawling thing had made, "Uncle" John labored with the rest, and he drove his beloved team into the canyon, where man had never dared to drive, and they closed up the wound with man-wrought things, and the waters moved back and lapped the hills a little higher up. In the summer it was an emerald gem in its setting, and it smiled back at the trees and the skies, which loved to reflect themselves in its placid waters; and when the storm-king came and howled his requiem at dying summer, and bent the giant trees into bows, and congealed the rippling water, and bade the Ice King lay his hands on the emerald gem, lo! it was a sea of silver! And they called that particular setting "Lake Spaulding," because "Uncle" John loved the mountains and the valleys and the trees and the waters, and they loved him, and each knew and spoke the other's language of affection.

He would come, long days after the hissing, roaring trains had displaced his stage, and commune with the things he loved; and he knew they were responsive. Then it came to pass that full of years and honors "Uncle" John passed over the Great Divide.

CHAPTER IV.

TODAY.

It is again summer in the South Yuba Canyon. The imprisoned waters of Lake Spaulding reflect the unflecked blue—the noisy stream below the dam flows through the canyon, crashing against rock after rock as if glad to be free; breaking into foam as it meets the wounded rocks; bubbling out of the boil-holes in the rocky bottom; swirling around and past a vagrant tree, and slapping the venturesome rainbow trout as he flashes with exultation in the sun.

A rock which has poised for ages on the cliff now loses its hold and plunges madly down, awakening the echoes of the hills as it bounds from shoulder to shoulder and plunges into the foaming stream.

Comes now a band of men, strong-limbed and young, bright-eyed and energy-full, to make Lake Spaulding larger, bigger and better, and to heal up other of the wounds of that crushing thing. Their leader a strong, buoyant, smiling lad, fair of face, blue of eye, and long of limb; and they crawl over the faces of the hills, and in the bottom of the canyon, where the waters foam; and they pierce the rocks and move them aside as playthings, these rocks that have survived the strife of ages.

And everywhere the leader is, and he sees the wounds the flinty heel made aeons ago, and he cries "Good!", for they mean anchors to him, and he finds where this crushing thing in its fury has ground the rocks into molecular particles, and he cries "Good!", for it means power to bend the rocks and heal the wound; and over the land swarm men to follow this leader.

But one day the sound of the men and their labor is hushed. The stream ripples on, yet the men cry for their leader. But he has gone to talk it over with "Uncle" John—for this leader, he whom they called "Jim," loved the mountains and the valleys and the trees, and they loved him.

CHAPTER V.

FINIS.

It is winter in the South Yuba Canyon.

It has snowed heavily the night before, when the Frost King was out. From "Old Man" a million Christmas trees glisten in the sun, and a myriad silvered floors of sleeping lakes can be seen. The smoke from many fires curls up to the leaden sky transparent vapors upon which many a Santa Claus could ride. The streams are hushed and still, save where now and then the blanket of snow has moved to disclose the emerald points below.

From the mountain caves glide out into the shadow of the night innumerable "Kris Kringles" with jingling bells; and on their mission of "Peace on Earth, Good Will Towards Men," gather as they go the evergreen, that is for joyousness, and the red berries that are for peace; and over the unbroken rifts of unsullied snow dip down into the fertile valleys where the poppy, reflective of our sunrises and sunsets, burns in radiant riot of color; so they go to bless and comfort those in both mountain and plain—with the thought that Christmas has come again.

At the Camp where came the leader who went away to talk with "Uncle" John, are gathered together a goodly company of goodly fellows to celebrate a Christmas Eve. And where could be found a better place than where Christmas trees grow and the spirit of Christmas breeds in the solitudes of Nature's grandest views?

They are men who know Nature and her moods: "Ed Roenings" who has skied from Fordyce, with "Gus Anderson," his "Fides Achates," a short jaunt for these two of thirty miles over trees and rocks on their snow shoes.

"A mere step," says Gus. "You remember, Ed, the time we slid over to Cisco that Christmas. Let's see, thirty-four years ago, wasn't it, and you struck the top of a pine and I had to pull you out of the snow-drift. Say, it was great." And Gus bursts into a loud laugh at the expense of his mate, who merely growls a responsive assent.

Then up speaks Evan Magnuson, who man and boy has lived at Spaulding winter and summer for years, and climbs the hills like the proverbial goat, on snowshoes, unlimited miles at unlimited speed. He is fair of face and light of limb and knows not fear.

Then old "Bill" Meservey—"They say he knows every man, woman, child, fish and tree from Grass Valley to White Rock Lake," says Jim Martin. "Why, he has walked over the ground so much you can see his footprints on the rocks like a mastodon's." Bill denies the impeachment regarding his pedal extremities, but it goes with the gang.

Jim has just ridden over from Colfax on "Dandy," and is aching for a show to don his skies for a trip over the snow.

Like all of them, Jim is some husky himself, and like them all has that color of health, that smile, and that clear eye that you can get only by mountain living.

"Herb" Cooper and "Leninger" are come from Auburn; "Bob" Linder has just dropped in, and as hosts there are Duncanson, "Dunc" everybody calls him—father of the camp, not because of age but because he can't help helping everybody with the substantials of life (not mere advice, mind you), and just can't help it because he was born that way; and "George" Burnside, great big George, breathing good cheer; and then Clifford the Engineer who earned a Carnegie medal by his bravery.

Night comes, yet the lights are not turned on. The glow from the fireplace lights up the jolly faces of the boys as they smoke their pipes after rare good Christmas fare, and chat of Christmas times in days gone by, and tell Christmas stories.

Then Magnuson suddenly speaks, addressing all: "Do you believe in ghosts?" And as with one voice comes back, "Hello Mag, got 'em again?" and then a shout of laughter that shakes the rafters of the log cabin.

Just then a gust of wind blows with a howl down the chimney; the snow rolls off the roof, the window opens, and each involuntarily shivers, these hardy muscled men, as they look out on the silver sheen of ice-bound Lake Spaulding. Such is suggestion.

"Why did you ask," finally asks "Dunc," after a pause.

"Have you a story?" shouts Jim.

Then they close the window and resume their smoking in silence, furtively glancing at each other and at windows, doors and hearth.

At last Magnuson, breaking the suspense, says: "Well I didn't believe in ghosts until last year, and if you like I'll tell you now why I do believe in them."

"Go on," chorus the gang.

"Last Christmas Eve," proceeds the brave lake-tender, "long about 12 o'clock at night, I had gone out to the valve-house on the dam, to be sure everything was all right, as it had been freezing hard all day, the thermometer down to about 12, when I saw up the lake, in between those two dead pines near where Fordyce Creek comes in, a peculiar light, that extended up the hill toward Signal Peak; and coming along that line of light, was what appeared to be a wagon with horses at full gallop.

"Soon it came nearer and nearer, the light always following it, like a spot-light on the stage, you know, until it reached the Lake; and then I saw it was an old stage coach with six horses! And as it neared the dam, my blood froze, for I recognized Uncle John on the seat, his eyes fixed on the canyon below! And he drove right past me, right past me, I tell you, and in another instant the whole outfit disappeared right over the spillway!

"Ugh, I was scared! I don't remember how I got back home. But I tell you I have been shivering ever since."

"Well" says Jim Martin, "that surely is a Christmas Ghost tale."

"I have heard," says "Dunc," "when I was sailoring, that ghosts never hit the same place twice, so I guess we're safe."

A silence falls over the group. Outside the wind has arisen, and the sighing of the trees makes a mournful cadence. Suddenly, the sound of bells is heard, faintly, as of some far distant cathedral—coming from over the Lake. A tremor runs over the men, but being of the kind that know no fear, they all as one advance to the door and look across the Lake.

As was told by Magnuson, here comes the vision, but surrounded by a beautiful light, the like of which these men have never seen. And the stage rolls into view down the frozen silvered waters, the horses prancing, the figure of "Uncle" John on the seat, with his grizzled beard, and his huge bulk bending to the reins! As he crosses the dam he cracks his whip, and as they look there is another on the seat with "Uncle" John, and, lo! it is the leader who went to talk things over with him! For they both loved the mountains, and the valleys and the trees, and the waters, the trees, the valleys and the mountains loved them.

And as the coach passes over the dam the cheery voice of "Uncle" John is heard over the sighing of the trees—"Merry Christmas to all"—"God bless us every one"—and the moon comes out and touches with silver light the myriad of Christmas trees on the Sierra Slopes, and from the wounds made by that crushing thing comes back the echo "Merry Christmas to all"—"God bless us every one."

R. G. Clifford's Heroic Act of Rescue

An Unofficial Entry in the Lake Spaulding Log

An unrecorded—officially at least—incident that took place at Lake Spaulding recently is worth relating not only for its dramatic quality but, also, because of the simple, unaffected heroism of the man who hesitated not to imperil his life to save another's.

The incident was witnessed by Mr. Rudolph W. Van Norden, the well known civil engineer, who happened to be visiting Camp Spaulding at the time. It is related by Mr. Van Norden himself in his own graphic way.

The storm had passed, the day had dawned clear. Grouse Ridge and Old Man Mountain cut a sharp outline against a sky that seemed almost too blue to be real. The very atmosphere seemed non-existent from its very transparency.

The flume which had been constructed down the canyon below where the great Spaulding dam will stand had just been put in shape to withstand the winter floods. Within it, running five or six feet deep and six feet wide, the water rushed in a seething torrent to the rocks below. Under the stringers which span the flume, but above the water, were suspended three insulated power wires which at the open section were allowed to hang close to the surface of the water.

Every man knew that the remaining days before winter set in must be utilized to the utmost to prepare the bottom of the gorge for the work of dam-building next spring. The fair and warm day was an inspiration, and all seemed to feel a personal responsibility to finish the work while the favorable spell of weather lasted. Suddenly one of the machinists, Huey Clendennen, while walking on the timbers at the top of the flume, as he came to the open hection stepped on a board which broke under his weight between the stringer and the rocky wall. In an instant he was plunged into the swiftly running water. Impulsively he clutched at the power-wires which, providentially, hung within his reach, and shouted loudly for help. Several men saw the accident and rushed over rocks and timbers in an effort to reach a point where they might grab him before the waters carried him to the end of the flume and dashed him against the boulders and rock masses.

R. G. Clifford, Resident Engineer at Spaulding Division, saw what had occurred and, realizing instantly the horror of an impending tragedy, made for the spot where Clendennen, his head partially submerged, was hanging desperately on to the power wires, and without a moment's hesitation lowered himself into the flume. Somebody procured a rope and Clendennen held on to it, and Clifford supported him with one hand while with the other he clung to the uncertain jagged form wires in the concrete wall alongside.

It was a desperate situation, and presently Clendennen became so weak that the rope slipped from his hand and he and Clifford together, half-suffocated from almost constant immersion and thoroughly benumbed by the cold, shot down the flume toward the rocks. The open section was almost passed when Clendennen once more wildly grabbed at one of the electric wires. This proved the salvation of his rescuer and himself, for it gave time for helping hands to reach the spot and secure them both.

Clifford says he doesn't remember just how it did happen. He says it doesn't amount to much, anyway. All he knows is that someone lent him a hand and when he realized the situation he was well away from the flume, very wet and cold, and the boys were shaking him by the hand and patting him on the back. But every man up there has an opinion of his own about the incident and what it reveals concerning the kind of stuff that goes to make "Pacific Service" what it is.

The Forebay Phase of the South Yuba Development

By HENRY A. WITTICH, Camp Drum.

Henry A. Wittich

Stepping from the train at the quiet little station of Towle, approaching the summit of the Sierras, one observes signs of a great industry not far distant. On the siding are loaded freight cars. The station platform is piled with machinery and commodities. A gang of men load heavy freight wagons. Then there is the road outside. Who after traveling a few hundred yards of its length would doubt that something beyond the ordinary was in progress?

In this article I shall confine myself to what is known as the forebay reservoir and the adjoining portions of the work directly connected with the generating of power. The site of the forebay reservoir, as stated by other writers in previous articles, is the crest of a saddle which falls away rather abruptly on both sides. It comprises a gently sloping area of approximately fourteen acres.

This area was covered with a thick tangle of brush, but the sturdy strokes of ax and brush-hook soon cleared this away. Following the brushers came the men who burned and removed all brush and logs. Have you ever sat before your tent in the evening and watched the flames mount high into the sky from the crest of an opposite ridge? Few sights are more impressive or weirdly beautiful than a burning brush-pile among the shadows of pines and firs.

Working in conjunction with the brush-burners were the men who toiled with pick, shovel and mattock to clear the surface of stumps and stubs. Then, too, came the powder men with their drills and kegs of powder

Forebay reservoir site before the clearing process

After the brushers came men to burn and clear away

and boxes of dynamite. It was these men who furnished the occupants of the present Camp Drum with diversions in the shape of magnificent fountains of earth that often reached the height of more than a hundred feet, and the awesome spectacle of a huge

Rolling the first layers on the forebay reservoir

Each layer is sprinkled and rolled until it is as nearly impervious to water as it is possible to make it

stump hurtling hundreds of feet through the air was not uncommon. It speaks well for the precautionary methods employed when one learns that not a single man has been injured by powder, although many carloads have been used up to the present time.

Photographer's tree and Reservoir whence is taken the water for sprinkling

An incident occurred on the forebay which shows the quality of the men who are helping to push the work forward. For the purpose of taking comprehensive views of the work in progress a large pine, standing on the western boundary of the area, was selected for a photographer's stand, but in order to attain the best results it was necessary that the tree be cut some forty odd feet above the ground. It was a dangerous undertaking, but a volunteer was found in the person of a young man who had recently finished school. Now, if you ever tried to fall a thirty-inch pine when working on terra firma you know it is not a snap. So, try to realize what it means when the cut must be made about forty feet above the ground, with nothing more than a single timber or two to work from.

As the last stroke of the saw started the top toward the ground, a gust of wind caught it and swung it in the direction of the supports from which "Red" was working. By rare good fortune he grasped another timber and thus reached the ground in safety. This is simply an incident, but it serves to illustrate the courage that enables young engineers to do great things.

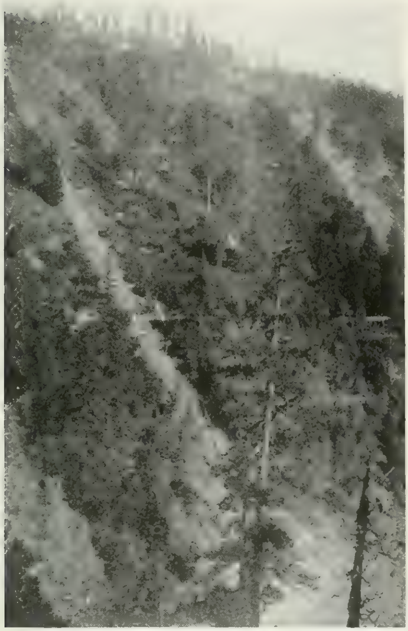
The construction of the forebay, while not of prime importance in the engineering world, is an undertaking of some magnitude. The building of an earth dam is the most important part of the work. Rising to a proposed height of 50 feet, with base approximately 220 feet in width and sides sloping to a crest 12 feet in width, with its 3,200 linear feet the dam assumes the proportions of a considerable undertaking. Contained within the slopes of the proposed embankment will be approximately 194,000 cubic yards of earth. Every inch of the entire embankment is treated to an approved packing process, which consists of harrowing, dampening and rolling. This is kept up continually so that each layer of earth is well packed, and as nearly impervious to water as it is possible to make it, before the next layer is placed.

The material is selected from the best obtainable. All vegetable matter is removed

Power-House site. Portion of penstock line shown in upper left-hand corner.

Perhaps the most dangerous part of the work is the construction of the penstock and tram lines, with a fall of 1,350 feet, from the forebay reservoir to the power house site. Great care must be exercised by those engaged on this work. At points the line is almost precipitous. A stubbed toe or the unwary placing of a foot on a loose rock might result in serious injury. The situation is given careful attention, however. The laborers are made to understand the delicacy of their position, and this, supplemented by their own good common sense, has carried the work on, so far, without accident.

Although every effort is used to break all the large rocks before casting them from the excavation, still it frequently happens that one harder and seemingly more addicted to the roaming life, starts on a rampage down the slope. It is then that the great force of gravity becomes evident. As you know, trees and



View of the line to the power-house

by root-pickers before the dirt is packed, so that there will be nothing included in the embankment which might later induce leakage. Rocks of size are treated likewise. In this way an absolutely water-tight dam is assured. A cut of more than 260,000 cubic yards is required to complete the reservoir. Approximately 740,000 square feet of concrete must be placed if it is found necessary to line the reservoir, whose capacity will be about 400 acre feet.

Connecting the reservoir with the canal which will convey the water from the Spaulding Reservoir will be an inverted syphon. It was found necessary to include this piece of enclosed conduit in the plans because of a dip in the canal line which could not be crossed as satisfactorily in any other way. The syphon will be constructed of steel riveted pipe 6½ feet in diameter, with a total length of 2,200 feet.

At work on the steep incline

brush are torn and broken by the bounding missile, and woe betide the unfortunate who gets in its way. However, the dangerous nature of the work is one of its greatest attractions. It is not an uncommon thing to see a laborer tackle a particularly dangerous stone with the ardor of a schoolboy out for a time.

Another attraction of the penstock and tram-line work, is the magnificent view obtained from nearly every yard of the descent. Below flows the Bear River, the waters of which echo pleasantly about the canyon after work has ceased in the evening. On the farther side rises a long, regular crest surmounting a slope cut by wooded ravines, whose natural beauty has proved so attractive that here and there the homes of some nature-loving persons can be seen. To left and right wind the Boardman Canal and the Miner's Ditch practically the only evidence of man's handiwork on this slope before the present project was begun.

Speaking of the Miner's Ditch recalls the fact that this country was extensively mined in the early days. The very site of the proposed Drum Power House was tunneled and washed by the men who first dared this region. As a reminder of that early struggle lie the rotten remains of tunnel timbers exposed by the hydraulic stream. Sticking woefully from the soil they had borne for years, they mutely tell of former struggles for wealth and progress.

An interesting, though difficult and expensive, part of the work, was the conveying of supplies and material to the Power House site. Foodstuffs were sent down on pack trains along with various small articles, but lumber and machinery had to be let down by ropes. It was interesting to watch the progress of a heavy piece of machinery down the slope. Two sets of blocks and tackles were needed for this work: one to prevent the load rushing down the slope, the other for motive power over the few places where it was needed. The greatest care was exercised when handling a heavy piece of machinery, as a single slip would most likely send it rushing down the side of the hill, assuring its complete destruction and endangering the lives of numbers of laborers.

The tramway now completed does away with this phase of the work, and the heaviest pieces will be delivered with comparative ease.

Tree being converted into a photographer's stand

Though only a part of the entire project, still the Second Divison comprises an important part of the whole that will add greatly to the development of the State and the comfort of its inhabitants. It is to be hoped that the work can be completed within the estimated time, and that no serious or unexpected difficulties will confront the men who conceived, dared, and are now guiding a project that spells five words to each and every citizen of the State:

Greater Progress, Comfort and Wealth.

The Hermit of Electra; Old Man Vogt

His Lonely Life of Toil and Trouble

By FREDERICK S. MYRTLE.

F. S. Myrtle

If you would visit our big power plant at Electra, in Amador County, whether you come in from the northwest by way of Jackson or from the southwest by way of Mokelumne Hill you must travel the concluding four miles of your journey along a fairly good road that skirts the north bank of the Mokelumne River. And about half a mile before you get to Electra you will pass by a little collection of huts and dug-outs that will give you the impression of having been the scene of some small mining enterprise in the days when men in that region all wore red shirts and top boots and toiled by day and dreamed by night with a never-failing hope.

Well, that spot has a history, for it marks the residence for thirty years of an old German named Vogt, H. F. Vogt, a pioneer, sole proprietor of that tiny collection of huts and dug-outs and, in his own unchangeable belief, lord of the surrounding country as far as the eye could reach, with the unbounded right to resist trespass upon his domains.

All who have visited Electra remember that strange character, his abode and the tales told of him and his eccentric ways. All the employees of the Pacific Gas and Electric Company who ever worked at Electra up to last February have good reason to remember him. For, at times his presence in their vicinity was a menace to their occupancy of the company's territory immediately surround-

Old Man Vogt apparently in a Tractable Mood.

Cottage No. 1

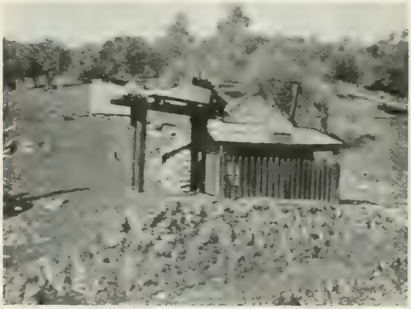
Cottage No. 3

ing the power-plant, to say nothing of the lawful pursuit of their daily labors therein.

Not a superintendent installed at Electra but had more or less trouble with the old man, and more than one employee of the company working up there reported having been treated to cursings and revilings, nay, even threats of open violence. Vogt, from all accounts, was not at all particular about the means he took to establish his claim to sole proprietorship of the manor-lands of hill and dale that stretch away from either bank of the slow-moving Mokelumne. So there were lively times around Electra when the old German's feudal spirit manifested itself to the temporary obliteration of his sense of the proprieties.

Those who visit Electra today may view the site of the old pioneer's home, but the thrill of expectancy will no longer agitate their breasts as they bowl along the road by the river. For, in the early spring of the now fast closing year the old man's long, hard struggle against unkind fortune came to an end.

From all accounts his nature must have become warped by adversity and grown more and more resentful as the days wore on and it became evident to him that the fortune he dreamed of was not to be his, notwithstanding his vehement assertions of confidence in his ultimate success. Yet there must have been moments when that hard nature of his relaxed somewhat and he became almost tractable, for he more than once told the story of his life to a neighbor and I have by me a picture of him in apparently amicable conversation with Mr. Frank Hensley, oper-



Cottage No. 2

Cottage No. 4

Vogt's Tunnel

ator at the Electra Power house. From Messrs. George H. Bragg, W. E. Eskew, Alexander Moran and Will T. Jones, all of whom enjoyed personal acquaintance with old man Vogt, I obtained information from which I am enabled to give an outline of his remarkable hermitlike existence up there in the mountains.

According to the story that fell from his own lips, Vogt when a young man made a small fortune as a freighter with mule teams, operating in the States of California, Nevada, Idaho and Montana. He claimed to have passed through exciting scenes, and when the fit was on him he would give vivid descriptions of terrific battles with Indians. But one day the iron horse came snorting and steaming through the West; the bottom dropped out of the freighting business and Vogt dropped out with it. He took his hard-earned money to Europe and spent most of it travelling around and seeing the sights; then, when his funds became low, he did what any other enterprising young man would have done and returned to California.

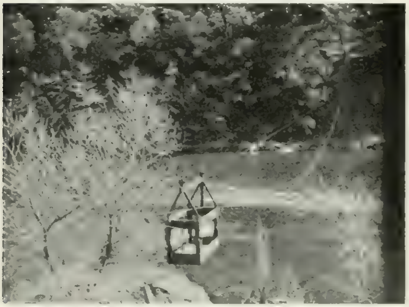
He engaged in the mining business, pitching his tent at Mokelumne Hill, on the Calaveras side of the river of that name. That was about the year 1880. Two years later he crossed over to the Amador side and located a mining claim on the river bank, where for years all his supplies had to be packed in over a steep trail. There he remained, an immovable rock upon that rugged hillside. Men came and went, but he stayed on, without a partner to share his hovel, without, they say, even a friend. He lived entirely alone and seemed satisfied with his lot, for when civilization in the corporate form of the Standard Electric Company ventured his way and started the construction of what is now the Electra Power Plant, Vogt looked upon the work of development with a most unfriendly eye. He resented even the building of a wagon-road into his place as an absolute trespass upon his private domain, and from that day until the day of his death he waged undying strife with the intruders.

It was, perhaps, not inconsistent with his assumption of feudal lordship over the lands around and about his dwelling that he should collect toll from persons desirous of making practical use of the road the enemy had built. He certainly presumed to decide who should and who should not pass along that road, and it is related of him that when the power-plant construction work was in progress and it became necessary to haul logs, machinery and all sorts of necessary material through his ranch Vogt reaped a fine harvest for a while in sacks of potatoes, which he was fain to accept in lieu of hard coin. But though he derived some satisfaction from this tollage he never really forgave what he considered as unwarrantable intrusion upon his privacy, and when he was short of funds it was not

Monitor used by Vogt

unusual for him to demand relief from his unwelcome neighbors in no uncertain terms.

It is not of record that the Vogt Consolidated Mining Company, by which high sounding title his holdings were known, realized any great profits. Vogt himself was wont to boast of a big find in a gravel mine, which he had worked to great profit until, in the course of time, he had worked it out. He also claimed acquaintance with Mackay, Flood and other stars of the mining firmament. But, in the later days at least, it did not appear that Vogt got anything more than a bare living out of that hillside, though he ran several tunnels into it and worked incessantly and with extraordinary energy. He was always involved in litigation with neighboring claim-owners, and every lawyer in Amador County had him for a client at some time or other.


The "Flying Dutchman", at one time the only means of crossing the river at high water season

There are many other stories told of this man. One relates to a wife somewhere back in Missouri. But, whether true or not the various tales have little or no concern with his life on that Amador hillside. The accompanying pictures show the cabins he occupied at various stages of his experience there. Each time he moved he went farther up the hill, notwithstanding he had to carry all the water he used. He lived to be 80 years of age and died, as he had lived, alone. No one was with him when his tempestuous spirit took flight. It was noticed he had not been seen about for several days; curiosity being excited, a party went to investigate and found him, dead, by the door of his hut.

At this glad season of the year, when every man of family loves to linger at his own fireside and have his children gather about his knees, the story of old man Vogt presents an almost tragic side. Who knows what aspirations burned in his breast, what ideals held his fancy, when as a young man he started out to battle with the world? Who shall say that, grim, forbidding spectre that he looked in his loveless old age, there were not times when his mind wandered back to his boyhood days, while some picture of a well-nigh forgotten past presented itself to his mental vision and stirred his withered heart? Who knows? Who shall say?

Mammoth Gas Contract

The Detroit City Gas Company records the largest contract for illuminating gas ever made in the history of gas production.

The contract is with the Ford Motor Company and calls for a daily supply of 2,000,000 cubic feet of gas to be furnished the mammoth Ford plant at Detroit for operating the various heating devices throughout the factory, including case-hardening furnaces, cyanide pots, forges and magnet fires, crucible furnaces and core ovens. The special convenience and adaptability of gas in these departments will undoubtedly add much to the general efficiency of the work in addition to saving labor.

A fair idea of the tremendous scope of this contract may be obtained from the knowledge that 2,000,000 cubic feet of gas per day is enough to cook dinners for 160,000 families or to operate 666,000 Welsbach lamps during an entire evening. It will be necessary for the Detroit City Gas Company to construct a special equipment to enable it to supply this enormous demand.

Reconstruction of Davis Substation

By GEO. H. HOLLIDGE, O. & M. Dept.

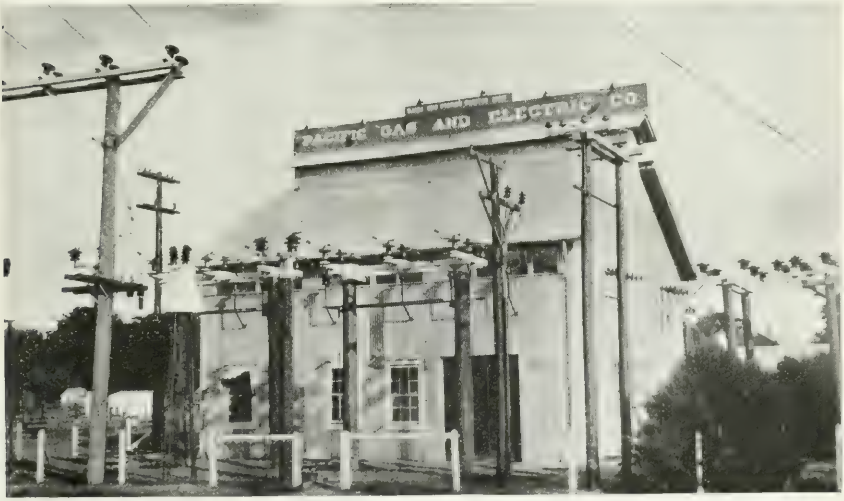
Geo. H Hollidge

The original equipment in the Davis substation having become inadequate it was decided to install modern apparatus. The work of reconstruction was started October 6, 1911.

First, temporary switches were erected on the ground outside the station and, one by one, the main bay lines were cut over to them, ultimately disconnecting the "juice" from the old equipment located in tiled compartments built on a steel gallery inside the station. Temporary lines were run around the building and, all switch busses being ready, the old equipment was abandoned Sunday, December 31, 1911. Immediately the whole force of men was put to work removing the gallery, equipment and offices, in fact, everything as it was deemed advisable to move the building, a corrugated iron structure 42 ft. x 40 ft. 6 in., eastward about 17 ft. On Sunday, December 10, 1911, the building was raised, placed on rollers and with the aid of a winch and ⅜-in. steel cable moved over to the new foundation.

The work of reconstruction then commenced in earnest. Trenches were dug and forms built into which concrete was poured, making the new 60 KV switch cells. The pouring of the concrete after the forms were partly up was accomplished by wheelbarrows and runways for the first nine feet; from there to the top, a distance of approximately 15 feet, the materials were hoisted on an inclined elevator operated by "one horsepower" of the four-legged type. The last bit of concrete was poured on January 10, 1912, making a total of 110 yards. In all there are five cells, each approximately 13 feet by 9 by 15 feet high. The walls are 6 inches thick and the ceiling 4 inches thick.

After the concrete had sufficiently set the forms were removed and all surfaces given a coat of cold water paint. These cells are

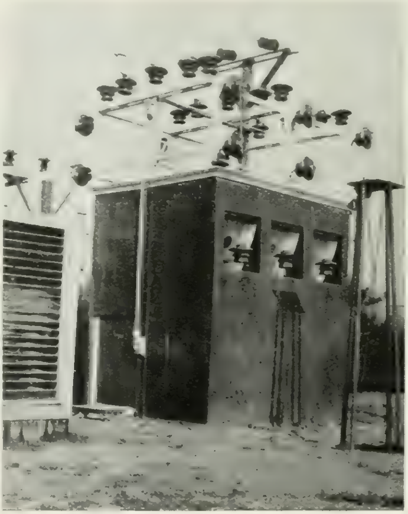


The new substation at Davis

Another View of the Substation

shown on another page. Pacific Gas & Electric Company oil switches of the four-break type manufactured in the Company's shops at Sacramento were set in the cells and connected to the operating handles at the switch board. One oil switch and two sets of single disconnecting switches were installed in each cell.

On Sunday, February 11, 1912, one-half of the new work was put into service, releasing the new equipment installed temporarily in switch-houses outside as mentioned in the beginning. During the next two weeks this equipment was installed in the respective cells for the lines leaving the building on the south. In these cells "Pacific Service" 60 kilovolt current transformers were installed. On February 25, 1912, the south cells were put into service and on March 3, 1912, the final paralleling switch was cut in, completing the new high tension installation.



60-K.V. Oil Switch-house on Bay 3 Line

Davis under present conditions has five squrces of power, viz: Bay line No. 1 North, Bay line No. 2 North, Bay line No. 1 South, Bay line No. 2 South and Bay line No. 3, which comes via Sacramento.

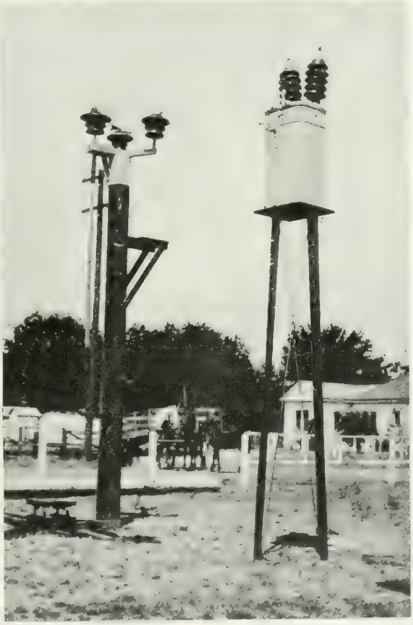
Should it be found necessary to work on one of the oil switches, a by-pass switch located in the line on top of the concreted structure can be closed,

Phone Board and 11-K. V. Switch Compartments

Main Switch-board

permitting the operator to open the disconnecting switches, thereby cutting out the oil switch without interrupting the service. This allows workmen to enter the cell with safety. Besides the work in the main building which takes care of the main bay lines, the Sacramento line known as Bay line No. 3 is likewise protected by a specially built tower designed by the Company's Engineers and built of steel, cement and plaster. The oil switch installed inside is operated by a handle at the main switchboard in the main building. A by-pass switch and disconnecting switches are also provided on the switch tower.

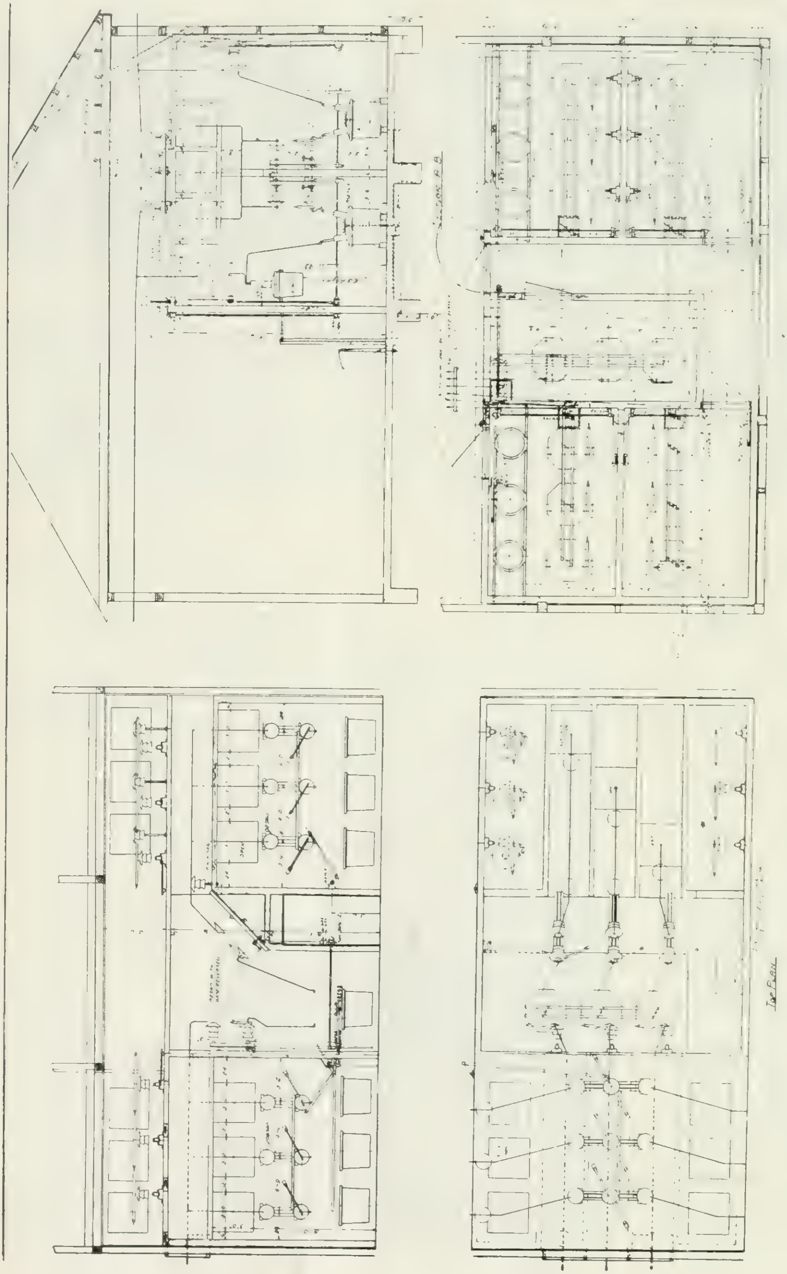
Shortly after the high tension installation was completed it was decided to give a local service at 4 kilovolt and 11 kilovolt. The former service had been single-phase at 2,300 volts. A bank of four (one spare) transformers, each 150 KVA, manufactured by the Crocker Wheeler Co., were put in operation, together with one feeder for 4 kilovolt service and one feeder for 11 kilovolt service.



Outdoor installation of potential transformers

G. E. Type C. R. regulators are installed on the town or 4 kilovolt service, giving a steady voltage for the residence lights. The 11 kilovolt service supplies the surrounding farms with power for irrigation. This polyphase service was cut in on May 12, 1912. During this reconstruction period a series tungsten street-lighting system was also installed. The constant current of 6.6 amp. is furnished by a Fort Wayne regulator.

On the main board the station ammeters indicate the amount of power being transmitted and, in times of trouble, indicate which line is down, thus telling the operator at a glance which switch to open. Pilot lights supplied by potential transformers located out of doors on high platforms tell the operator when the voltage comes back once it has been taken



Arrangement of H. T. Oil and Disconnecting Switches at Davis Substation off, and should it be necessary to synchronize it is only a matter of inserting plugs in the proper receptacles on the board to cut in the synchronizer to tell when to close the oil switch.

Davis is one of the most important switching stations on the system, and as constructed at the present time represents the latest practice in design of apparatus as developed by the Company's organization.

* * *

IN MEMORIAM—HUGH ROY MOORE

THE STORY OF A BRAVE MAN'S DEATH

The Pacific Gas and Electric Company lost a brave man in Hugh Roy Moore, an operator at Station "E" in the San Francisco District, who was fatally injured on the morning of October 15th.

Moore was alone in the station when a disturbance occurred on an 11,000 volt cable connecting the station with the general transmission system. Intending to relieve the trouble, he pulled one blade of a disconnecting switch connected with the cable. This set up an unbalanced condition which caused an oil switch installed on the cable to explode, bursting an oil tank in which the switch operated. About a gallon and a half of oil was set on fire and thrown up against the ceiling of the station. Moore was then standing in front of the compartment or partition on which the switch tanks were located. When the oil struck the ceiling it was thrown over the compartment wall and down upon Moore's person, setting fire to his clothing.

Moore was terribly burned, yet he was able to tear most of the burning clothing off his body and to put on the coat and vest of his street suit. He then tried to extinguish the fire at the oil switch and, failing, climbed a flight of stairs to the switch gallery in an effort to reach a telephone to call aid. Half way across the gallery floor he collapsed and fell into a chair. There he remained until outsiders, attracted by the escape of smoke from the station, came to his rescue. He was found unconscious in the chair, but as his rescuers picked him up he partly recovered his senses.

His first thought was for the safety of the station, and he demanded that he be left alone until Station "A" or the load dispatcher could be notified to shut down the station. Knowing nothing about the operation of the station and finding the place full of smoke, the rescuing party refused to send any message, but hastily carried Moore out of the station, ignoring his protests that the company's property be saved first.

Moore was taken to an Emergency Hospital, where it was found that some of his clothing was still on fire. His stockings were burning in his shoes when he was placed on the operating table. As soon as the company learned of Moore's injury it had him removed to the German Hospital and given every attention, but his injuries were so severe that his life could not be saved. He died that evening about 10 o'clock.

Moore was a comparatively new man in the service of the company. He was first employed last April. During his service with the company he worked continuously in the San Francisco District. He had been previously employed at electric stations in the East. His home was at Oklahoma City, Oklahoma, where he is survived by a father and a brother.

Requiescat in Pace.

Noting Progress of the World's Fair

Events in connection with the Panama-Pacific Exposition followed fast upon the heels of one another during the month that has passed.

Two foreign countries and two states of the Union were added to the list of those that have selected the sites for their exhibits.

Early in the month of November the site for Sweden's Exposition building was officially selected by John Hammar, Special Commissioner from that country. The ceremonies included a review of United States Infantry, and the Swedish Singing Society, a musical organization of some strength, took part in the dedication programme.

Portugal selected her site November 26th through her representative, Minister J. Batalha de Freitas, Envoy-Extraordinary to China. This made the fourth foreign nation to take possession of a site on the exposition grounds out of the list of twenty-one that so far have accepted President Taft's invitation to participate.

Quite a festival accompanied the dedication of the site for the New York exhibit by the Commissioners from the Empire State. The commission consists of Norman E. Mack, Chairman; Daniel L. Ryan, Secretary; John R. Yale, Vice-Chairman; William Leary, Assistant Secretary; Arthur A. McLean, Joseph B. Mayer, John D. Coffin, James A. Foley, Thomas H. Cullen, James J. Frawley, George B. Cobb, John F. Murtaugh, Thomas H. Bussey, George H. Whitney, Alfred E. Smith, Daniel D. Frisbie and Frank L. Young. They arrived here November 25th, and four days later they formally appropriated the site upon which there will be erected a building in keeping with the dignity and importance of the State which claims great New York City for its own, and whose legislature has devoted the sum of $750,000 to the purpose.

Needless to say our eastern friends were most heartily received. They were shown Californian hospitality at its historical best. Chairman Norman Mack expressed unbounded delight in everything he had seen and prophesied an unqualified success for our great 1915 undertaking.

Another State, that of West Virginia, selected its site on the very same day as New York, so that the dedication ceremonies were held jointly. Nor did the South play second fiddle to the North either in participation or appreciation of the hospitality extended. Colonel Fred Paul Grosscup and Mr. C. O. Nagel were the Commissioners from West Virginia.

Another event of significant importance was the visit of Sir Thomas Lipton, who breezed into town and breezed out again in characteristic fashion, contriving in the interim to put in a very good time and make all he met as well as himself enjoy themselves. On his arrival in San Francisco the enterprising yachtsman from across the Pond gave an encouraging message to the people of San Francisco and promised to do all in his power to forward the interests of our Exposition. The longer he stayed the greater his enthusiasm developed, and before he went away he engaged to build a special yacht and send her over here to take part in the International Regatta to be held in connection with the World's Fair.

In the way of actual progress the most important event of the month was the formal adoption of all plans and designs for the buildings by the Exposition Architectural Commission, after a session of many days which came to a close December 3rd. The plans which have now been approved by the Commission are as follows:

Machinery palace, by Clarence R. Ward and J. Harry Blome of San Francisco; the Festival hall, designed by Robert Farquhar of Los Angeles; the Horticultural Building, by Bakewell & Brown of San Francisco; the Palace of Fine Arts, by Professor Maybeck of this city; the tower of the Administration Building, by Carrere & Hastings of New York; the Court of Four Seasons, by Henry Bacon of New York; the Court of Abundance, by Louis C. Mulgardt, and the south courts by George W. Kelham.

From an architectural standpoint, the great tower of the Administration Building will be the dominating feature of the Exposition, rising as it will from the southern entrance of the grand Court of Honor to a height of 375 feet. The base of the tower alone will occupy an acre in extent.

The Horticultural Building, or Glass Palace, will probably be one of the most attractive of all the buildings. It will be constructed entirely of glass and will cover five acres. It will be surmounted by a dome 150 feet high. The building will be unique in that it will be the greatest glass building ever constructed.

The Court of Four Seasons will be one of the most beautiful of all the great inner courts.

In harmony with its title there will be, in each of the four corners, great niches screened by classical colonnades, which will frame four large mural paintings suggestive of the seasons, spring, summer, autumn and winter.

The Festive Court will present one of the most marvelous effects at the Exposition. It will be of Spanish-Moorish architecture. In this building will be held most of the pageants which will be one of the leading features of the Exposition. It will also afford a proper setting for Oriental and modern drama on an immense scale.

The Palace of Fine Arts will be 600 feet in length. The architectural effects of the building will be enhanced by tropical plantings from distant parts of the world. The Festival Hall will contain one main auditorium with a seating capacity for 3,000 people; in addition, however, there will be ten other halls in the same building to be used for meetings and assemblages.

John E. D. Trask, Secretary and Manager of the Pennsylvania Academy of Fine Arts, has been appointed Chief of the Fine Arts Department of the Exposition. Mr. Trask has been sixteen years with the oldest art institution in the country. Under his management the exhibitions of the Pennsylvania Academy have been of the greatest possible value. His wide experience in handling this kind of work, combined with his acquaintanceship with the artist world and his knowledge of where the best material is to be found, make him eminently fitted for the important task to which he has been assigned.

President Charles C. Moore has issued a statement epitomizing the work already accomplished. It shows that the Exposition, both in plan and construction, is already far ahead of its schedule. Mr. Moore promises that by June, 1914, the exhibits of the world can be rolled into the spacious halls of the exhibit palaces in the cars in which they were loaded in distant States and from the ships which have borne them from the ports of the world. "No exposition before ever dreamed of opening its halls nine months before its gates. The Exposition in 1915 will accomplish this result," states Mr. Moore. Then follows this Christmas message:

"At the approach of the Christmas season when thousands of Californians are sending their relatives in the East and in foreign lands tokens of love and friendship, it will be opportune that every business letter, every note to friends, every Christmas token that goes either to America or abroad, may contain some message of Exposition greeting and an invitation to the world.

"All are invited to call or send to headquarters of the Exposition and obtain attractive literature published for this purpose.

"The management appeals to every commercial body with interests abroad to advise the world that the commercial organizations of California are united in supporting the trust bestowed upon California."

From left to right: Melbourne, Fitzhenry, Klein, Smith, Melchoir, Scanlon, Swan, Wrinkle, Mensing, Coghlin, Gilhuly.

"Every One A Champion"

After having a very successful baseball season, the "PACIFICS" have discontinued their activities on the diamond until January, 1913.

It might be of interest to note the results of games played this year, and, as is shown, we have the proud record of winning 12 of the 15:

	Date.	Opponents.	Our	Opp.	
1.	Mar. 2	U. of C. Freshmen	2	1	
2.	" 9	Army Team, Presidio	9	1	
3.	" 16	U. of C. 2nd team	10	4	
4.	" 23	All Stars	9	3	
5.	" 31	Alameda Moose	21	5	
6.	Apr. 6	Western Elect. Co.	6	5	(11 innings.)
7.	" 13	Naval Training Sta.	5	1	
8.	" 14	Burlingame	0	6	
9.	" 21	San Rafael	6	8	
10.	May 11	Pac. Tel. & Tel. Co.	4	6	
11.	July 13	Army Team, Presidio	5	2	(12 innings.)
12.	Sep. 7	Oakland District	6	5	
13.	" 14	Army Team, Presidio	12	1	
14.	Oct. 12	Oakland District	13	5	
15.	Nov. 16	Oakland District	7	6	
		Total runs	115	59	

Several of the contests were hard-fought, especially the 1st, 6th, 11th, 12th, and last games.

Members of the Oakland and San Francisco District teams enjoyed an Italian "feed" following this last game and a series between these two teams was arranged for next year.

Mgr. J. A. Britton, Jr. of the "Oaks" suggested that clubs be organized by the San Jose and Sacramento District employees; then each of the four clubs could play three or five games around the circuit. Let's hear from these two Districts on this subject. "Muggsy" Melbourne, Mgr. of the "PACIFICS", is now seeking games with the Santa Clara, Stanford, St. Mary's, St. Ignatius and U. of C. teams for 1913.

M. B. Mensing.

PERSONALS

Word has been received from Mr. Herbert Wilson, formerly employed as stenographer in the President's office, that he is at present sojourning at Port au Prince, Haiti. He is in the employ of the Caribbean Construction Company of New York, who are building a railroad at that point. He wishes to be remembered to all the boys and says he will be home in 1915.

Mr. Herbert Knopf, of the Electric Distribution Department, Redwood District, is the father of an eight and one-half pound boy, born November 1.

Who said girls couldn't keep secrets? Well Miss Alice E. Byrne proved an exception; she kept the secret of her engagement to Mr. Paul McCarthy, a well-known attorney of San Francisco, from her friends for several months and they in turn kept a secret. Yes, sixteen kept ONE secret, and gave the bride-elect a surprise luncheon and theater party on Saturday, October 19th.

The affair took place in the banquet room of the Hotel Stewart, where a delightful lunch for sixteen was served. The table decorations were roses of Killarney, an individual rose for each member with a corsage bouquet for the bride-to-be. Unique place cards were provided for the guests. Miss Byrne was the happy recipient of a "Snookums" doll as a table favor. Those present at the luncheon were:

Miss Byrne, of the Distribution Department; Miss Pierce, of the Land Department; Miss Curtis, of the Engineering Department; Miss Lane, of the Commercial Department; Miss Doub, of the Law Department; Miss Smith, of the Distribution Department; Miss Small, of the Appliance Department; Miss Downs, of the Distribution Department; Miss Lamont, of the Drafting Department; Miss Loewenguth, of the Vice-President & General Manager's Department; Mrs. Holton, of the Claims Department; Miss Sonneborn, of the Engineering Department; Mrs. L. B. Morton (nee Winchell), formerly of the Engineering Department; Mrs. Geo. Taylor (nee Smith), formerly of the Publicity Department; Miss Murphy, of the Operation and Maintenance Department; Miss Glazier, of the Operation and Maintenance Department.

After the luncheon, the party repaired to the Savoy with their roses of Killarney, Snookums and a generous contribution of candy presented by two "heroes."

The Byrne-McCarthy nuptials took place on the morning of the 12th of November, and the happy couple went to Southern California for their honeymoon. We all wish Mr. and Mrs. Paul McCarthy every happiness.

Mr. Charles H. Delany of the O. & M. Department, Steam Section, appeared before the Associated Electrical and Mechanical Engineers of the University of California, October 25th with a paper on "Steam Auxiliaries to High Tension Transmission Systems." Mr. Delany's paper was enthusiastically received by a representative body of students and he felt sufficiently rewarded for his efforts by the evident interest accorded them.

Mr. Delany read a paper on Steam Distribution before the National Association of Stationary Engineers, California No. 3, last September, which his Chief, Mr. Frank Varney, regards as of the greatest possible value to the work of his department.

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Pacific Gas and Electric Company
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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

Vol. IV DECEMBER, 1912 No. 7

EDITORIAL

"PACIFIC SERVICE MAGAZINE" TO "PACIFIC SERVICE"—Merry Christmas!

The slogan by which the Pacific Gas and Electric Company has for some time past advertised to the world the comprehensive character of its undertaking and the significance of its mission has "caught on," so to speak. It is now recognized not only within the territory covered by the company's system but all over the East, where besides the many enterprises of similar description to ours all the great financial houses whose business it is to handle public utility and other securities are watching our rapid progress of development with the greatest possible interest.

And so, having "caught on," as we have said, we affirm our adoption of this comprehensive slogan by conferring it as a title upon our house journal.

For a long while now every member of our organization—and there are nearly five thousand of them—has become accustomed to speak of our enterprise and hear it spoken of by the term "Pacific Service"; what more fitting, then, than that this record of our doings which we issue monthly to our members, our stockholders and our subscribing friends and in which we take, we hope, a pardonable pride should bear this title of "Pacific Service" which, in our humble judgment, will impart to its readers—as soon as they have grown accustomed to it—a clearer meaning of what we are and what we stand for than the name heretofore used, which is nothing more than the official title by which our company enjoys legal entity and the right to do business within the State of California.

This change has been under contemplation for some time. It is not always wise to swap horses in the middle of the stream, and we had been doing very well as we were in the way of attracting attention to our journal and drawing favorable comment from its readers. But it was seen that if we desired to be known generally by the slogan of "Pacific Service" we must make that slogan all-embracing; and so now it comes to pass that the deed is done and what at first will appear to be a new magazine devoted to the industries we represent is launched upon the gas and electric world.

On examination, however, it will be found to be a new publication in title and cover only. It is, in effect, merely a continuation of the old. And to show to our readers that we are merely taking up the thread of the story where we left off a month ago, "Pacific Service Magazine" starts with Volume 4, No. 7.

We draw to the special attention of our readers the new front cover which we venture to think is something worth looking at. The design is from the facile brain and hand of our esteemed Chief of the Drafting Department, Mr. Joseph P. Baloun. Only last month we presented to our readers a brief sketch, with illustrations, of our drafting department, and in it we described Mr. Baloun as an enthusiast. Right heartily we reiterate that compliment. He is one who helps to enable "Pacific Service" to carry out its all-important mission in the world of progress and development.

So "Pacific Service Magazine" comes forward in its new dress and wishes one and all a Merry Christmas! We hope and trust that this will indeed be a glad season for all our members and all our friends. A great deal has been written about this one sacred occasion, which is described by Dickens as the season of immortal hope, the birthday of immortal mercy, and concerning which he carols thus tunefully:

"Nearer and closer to our hearts be the Christmas spirit, which is the spirit of active usefulness, perseverance, cheerful discharge of duty, kindness and forbearance! It is in the last virtues, especially, that we are, or should be, strengthened by the unaccomplished visions of our youth; for who shall say that they are not our teachers to deal gently even with the impalpable nothings of the earth? Welcome, old aspirations, glittering creatures of our ardent fancy, to your shelter underneath the holly! We know you and have not outlived you yet. Welcome, old projects and old loves, however fleeting, to your nooks among the steadier lights that burn around us. Welcome, all that was ever real to our hearts, and for the earnestness that made you real, thanks to Heaven!

"Welcome, everything! Welcome, alike, what has been, and what never was, and what we hope may be, to your shelter underneath the holly, to your places round the Christmas fire, where what is sits open-hearted!"

That Christmas of the older world across the seas, of which the Master writes, is not ours in California. Here there are no doors and windows closed against the weather, albeit our mountain ranges are snow-clad. King Christmas comes vaunting his regal state in a halo of gold that is emblematic of our glorious habitation by the shores of the Pacific. Poverty and misery are all but strangers to us here. We live in a land of plenty where there is opportunity for willing hearts and willing hands.

But the old spirit of Christmas is here, just the same, and we look upon this festive season as one of joy and good fellowship, when "Peace on earth, good will toward men" is the watchword for one and all of us. So, once more, Merry Christmas!

That even so time-honored an institution as old Santa Claus may be induced to march with the times is shown by the frontispiece of this Christmas issue, which depicts the old gentleman in the act of turning on the electric light. The design is by Mr. Dan Sweeny, a well-known young cartoonist of San Francisco.

The State of Nebraska has found ownership of light and power plants a failure and has decided to get rid of her burden with all possible speed.

For years the State ownership fever raged there unchecked, and light, power and water plants were installed in all State institutions. These plants were under direct control of the Board of Public Lands and Buildings. And now, after years of trial, the Board has decided to go out of the light and power business and contract with privately-owned concerns for these necessary commodities. Secretary of State Wait admits that the State-owned lighting plants are operated at a considerable loss and that there is no possible way of breaking even. He is forced to the realization that it will be both cheaper and better to purchase light and power from people whose business it is to both generate and distribute the same and who may be credited with being experts in that business.

Municipal ownership seems to be in about as bad a way as State ownership, from all accounts. "Public Service" is devoting a good deal of attention to that problem just now, and each month it publishes several pages of statistics from which it would appear that municipal lighting plants all over the country, while affecting to lower rates to the consumer, are raising rates to the taxpayer at more than proportionate speed.

ITEMS OF GENERAL INTEREST

Vice-President and General Manager John A. Britton returned to San Francisco November 24th from a three weeks' trip in the East.

The main purpose of Mr. Britton's trip was to attend a conference with Secretary of the Interior Fisher at Washington in connection with the work of the California Water and Conservation Commissions. Previous to this several conferences had been held in San Francisco between parties representing, severally, the Commissions named and the various light and power interests of the State, the purpose being to decide upon recommendations in the way of national legislation to enable the power companies to work more advantageously not only for their own interests but, also, those of the people they serve.

When the conferences began both sides were agreed upon two main issues: first, that it was deplorable to think of millions of dollars' worth of power in the forest reserves going to waste for want of development; second, that the present laws made private enterprise impossible because of the restrictions of franchise which made it possible for any power company to be ejected at the governmental will. Several other matters were discussed at these conferences, and Mr. Britton was chosen the representative of all parties concerned to present the case for the State of California to the national administration.

While in the East Mr. Britton, at the request of a number of the great financial houses interested in public utility securities, gave illustrated lectures demonstrating the great progressive work undertaken by "Pacific Service." These lectures were given in New York, Boston, and Chicago, and Mr. Britton took advantage of the opportunity to tell his audiences a good deal about the Panama-Pacific Exposition, of which he is a director. The San Francisco "Call" quotes Mr. Britton on his return as follows:

"I found more interest in the Exposition and its effect on California than in anything else in the East. The extent of the new development of our company opened the eyes of the Easterners, as did also what I told them about the growth of the State.

"While in New York I appeared before the listing committee of the New York Stock Exchange to ask for the listing of our recent issue of $25,000,000 of general refunding mortgage bonds. Our request was granted. Chairman Heaton of the committee commented on the great amount of Eastern capital that was coming to California and talked encouragingly of the future of this State. The financial interests of the East are looking more and more into California propositions, because of the stability of our investments. This State is notable for its few failures, and this fact has won the confidence of the Eastern investors."

Mr. F. G. Baum, Chief Engineer of our Hydro-Electric Department, accompanied by Messrs. Paul M. Downing, H. C. Vensano, and W. H. Harrelson, recently visited the construction work in progress at the Big Creek project in the San Joaquin Valley and at the Los Angeles aqueduct.

The first-named is located about 75 miles from Fresno and is of particular interest to the hydro-electric industry from the fact that when completed it will be the biggest high-voltage transmission system in the world, sending electric energy a distance of 250 miles into Los Angeles at a voltage of 150,000. The visitors were shown over the construction work by Mr. Shuffleton, Manager for the Stone and Webster Company, whose enterprise it is. They passed two days there, were most hospitably entertained and much impressed by what they saw.

Three active days were passed at the Los

Angeles aqueduct under the chaperonage of Mr. J. B. Lippincott, Assistant Chief Engineer. Mr. Baum speaks in enthusiastic terms of this wonderful piece of engineering. He says:

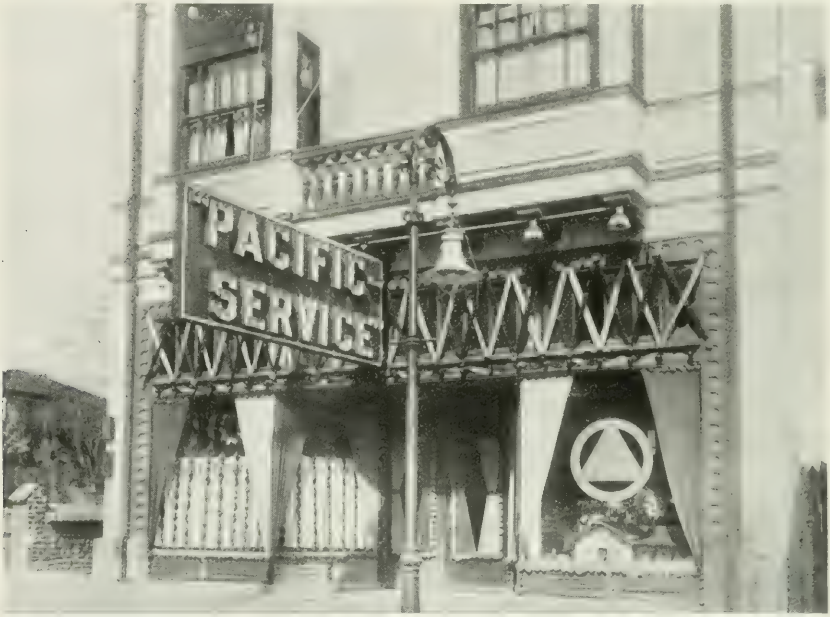
"It is the most marvelous piece of water conduit I have ever seen, travelling 237 miles over mountain ranges, through canyons and across deserts before delivering its water into the big reservoir near Los Angeles City."

"Pacific Service" being essentially a home industry, it was but right and proper that our company should be fittingly represented at the annual Exposition of the Home Industry League, which was held in San Francisco November 13th to 23rd inclusive.

The Exposition was located in the Auditorium, a large and roomy building on Page and Fillmore streets. It was, is it was intended to be, thoroughly illustrative of home industrial progress. Every enterprise for which California is famous was represented in the gayly decorated booths. The "Pacific Service" exhibit occupied an area of 360 square feet in a most advantageous location. Suspended above and stretching between the galleries running down the sides of the building was a huge electric sign "Pacific Gas and Electric Company," while a smaller one of similar design served to illuminate the interior of the booth.

The booth itself was equipped as a lounging room. There were no appliances, either gas or electric, on hand; no "demonstration" of any kind was gotten up to attract the passers-by; but there were lounge-chairs and writing tables in plenty, with a center table on which the current magazines invited perusal; and on each stood a shaded lamp of picturesque design. There were telephones for the accommodation of all comers. Photographs

Our exhibit at Home Industry League Show



Company's Office at San Rafael decorated in honor of the Marin County Carnival

of the company's various power plants hung around the walls and the "Pacific Service" trademark was displayed on the exterior of the booth.

Needless to say there were many callers, and there were heard on all sides expressions not only of admiration but, also, of appreciation.

We have among our number an expert in wireless telegraphy, it appears, who although an amateur at the business has been making himself heard from and of. The following dispatch to the San Francisco "Call" of November 1st, is from its correspondent at Grass Valley:

"W. C. Bowman, superintendent of the Deer Creek power house of the Pacific Gas and Electric Company, located in a canyon several miles from this city, has established an amateur wireless telegraphy plant whereby he is able to glean snatches of news from all parts of the world in his lonely vigils.

"The receiving instrument is suspended at a height of 110 feet between two big spruce trees standing 400 feet apart. Bowman is able to pick up messages up and down the coast as far north as Canada and as far south as Mexico.

"On several occasions he has called other stations and conversed with the operators."

"Pacific Service" is again in the front rank with two first prizes during the Marin County Carnival at San Rafael.

From October 24th to 26th a three-day carnival was held in honor of the building of San Rafael Mission. The committee offered a prize of ten dollars for the best decorated store in San Rafael and the local I. O. O. F. lodge offered the same amount. Both of these prizes were captured by the Pacific Gas and Electric Company and promptly turned over to charity.

The office was draped with bunting of the carnival colors, yellow and red, and outlined with electric lamps of the same colors. The "Pacific Service" sign was hung outside and lighted for the first time on the opening night. In addition a model of the old Mission San Rafael was displayed in the window. This was constructed by employes of the company and was set in a bank of redwood boughs. By the use of colored lamps a moonlight effect was obtained.

The display caused a great deal of favorable comment among residents and visitors and when viewed by some of the oldest inhabitants was said to be almost an exact reproduction of the original building.

The town was very nicely decorated with bunting and electric lights. Incandescent lamps were strung across the principal streets. The merchants spent considerable time and money on their store decorations and the result was very pleasing.

The carnival lasted for three days and brought many visitors to San Rafael from all parts of the State. All enjoyed themselves and the carnival was pronounced a great success.

The company's employes engaged on the big construction work at Lake Spaulding were treated to an elaborate Thanksgiving dinner at the scene of their labors.

The occasion was a dual one, for it celebrated not only the auspicious season of Thanksgiving but, also, the successful placing of the first bed of concrete in the bottom of the South Yuba river at the spot where it is proposed to dam the waters and transform Lake Spaulding into a vast storage reservoir of 30,000,000,000 gallons capacity. The placing of this initial foundation was no small undertaking, and now that it is safely lodged there the company's engineers feel that they are safe against all interference or damage by winter storms.

There is a corps of about 450 men up there just now, including engineers, draughtsmen, mechanics, laborers, etc., and they presented a noble front to the plentifully spread tables in the camp dining-room. The following menu was discussed with evident appreciation:

Celery Soup
Roast Turkey Cranberry Sauce
Cauliflower Mashed Potatoes
Parsnips Baked Sweet Potatoes
Pudding Hot Mince Pie
Apples
Tea Coffee Cider
Assorted Nuts

Up to the present the work at Lake Spaulding and, also, at the site of the Drum Power House below it has progressed without serious interruption. It is hoped that it will not be found necessary to shut down on surface work before Christmas. Work on the mile-long tunnel through the rock leading from the dam will be prosecuted right through the winter and, it is expected, completed by the time the spring sunshine permits a renewal of full activities in that region. Chief Engineer Baum expresses confidence that the Drum power plant will be in a position to grind out electric energy by about the first of November next year.

The first get-together meeting, including a banquet of the officers and employes of the Colfax and Placer Districts, was held in Auburn on Monday, November 18th, 1912.

Part of the time was spent in viewing lantern slides, very ably described by Fred R. George. Those covering the South Yuba Construction were explained by Mr. P. M. Downing.

Dinner was served at the Freeman Hotel, followed by a practical demonstration of water measurements under various conditions. As a result, all feel better acquainted and have learned something about the company and its workings.

Those present were: P. M. Downing, W. M. Roberts, J. E. Baricau, W. Keskey, T. Jefferson, W. E. Bellows, A. P. Clark, H. S. Wilson, K. Corbin, Wm. Howiler, J. H.

Carr, A. Olsen, A. D. Lininger, H. M. Cooper, Tom Perry, F. A. Philbrick, A. L. Schroeder, H. C. Peterson, C. A. Waite, F. D. Rollins, J. C. Feeley, J. W. McCrary, H. Tudsbury, J. W. Reed, L. E. Luther, J. A. Haines, A. L. Trowbridge, W. Corbey, E. N. Murphy, R. E. Linder, K. Wilkie, C. Kerr, A. A. Halliker, J. K. White, Geo. Colwell, A. G. McCrary, Frank Puffer, E. E. Fletcher, Dave Jones, John Spencer, Fred R. George, G. A. Wilkie, Geo. E. H. Betten, Geo. Haven, W. E. Lininger, Z. Kutschker, J. C. Jones, Geo. Atwood, A. E. Gilkey, S. A. McCrary, G. W. Mills, J. L. Elder.

The action recently taken by the American Gas Institute at its meeting at Atlantic City by unanimously voting to hold its annual meeting in San Francisco, in 1915, and to participate in an International Gas Congress, is evidently exciting the interest of the English and Continental gas men, as evidenced by the following excerpt from the Journal of Gas Lighting, November 5th, 1912:

"There are to be great doings at the Panama-Pacific Exposition in 1915 at San Francisco, and the Institute has agreed to hold an International Gas Congress there then. Those gas engineers in this country or on the Continent who want to look forward to a good holiday and a good time in the autumn three years hence cannot do better than book up this as a possible engagement. We warrant those who go from here will have a hearty welcome.

"Mr. E. C. Jones, of California, as a special representative from the Pacific Coast Gas Association, addressed the meeting to urge that the Institute participate in an International Gas Congress to be held at San Francisco, California, in 1915, in connection with the Panama-Pacific Exposition. The Institute voted that such a Congress be held in the week beginning Sept. 27th, and that the incoming President appoint a committee to act with the Pacific Coast Association. It is not too early to express the hope that our British and Continental confreres will be able to attend this congress in goodly number. It will be held the week after the International Engineering Congress, at which engineers from all over the world are expected, and this should be an added inducement for foreign gas engineers."

Following is an excerpt from Woodland's report for the week ending October 19th:

"The new substation presents a very attractive appearance and when Landscape Gardener Mr. Barker finishes planting blue grass and white clover it will be a beauty spot of which all Yolo County will be proud."

The California Association of Auditors and Accountants of Public Utilities was organized in San Francisco last October, with the following officers and board of directors:

President, M. H. Bridges; Vice-President, B. T. Story; Secretary, H. E. Nowell; Treasurer, F. A. MacHugh. Charter Members and Board of Directors: W. B. Bailey, Auditor Great Western Power Company: M. H. Bridges, Auditor Pacific Gas and Electric Company; F. J. Blanchard, Auditor Sierra and San Francisco Power Company; A. Herrick, Certified Public Accountant; W. E. Houghton, Auditor Los Angeles Gas and Electric Corporation; A. H. Kayser, General Auditor Spreckels Companies; A. Lambie, Pacific Coast Auditor H. M. Byllsby & Co.; H. E. Nowell, Auditor Oro Electric Corporation; F. A. MacHugh, Special Accountant United Properties Company; C. P. Staal, Auditor San Joaquin Light and Power Corporation, and B. T. Story, Auditor Southern California Edison Co.

A circular issued to all auditors and accountants of public utilities in the State of California announces this organization as the outgrowth of a committee of representatives of these utilities appointed by the Railroad Commisison for the purpose of discussing classification of accounts presented by the Commission for gas and electric companies.

At the regular meeting to be held next March it is expected to complete organization.

DOINGS OF OUR COMPANY SECTION
N. E. L. A.

The regular monthly meeting of the Pacific Gas and Electric Company Section of the National Electric Light Association was called to order at 8:15 o'clock P. M. November 20th; Henry Bostwick, Chairman pro tem, in the chair. Upon roll call, the following members answered present:

Henry Bostwick, Ralph Elsman, L. F. Galbraith, L. H. Newbert, C. J. Wilson, F. C. Ensinger, F. S. Gray, H. B. Hatfield, A. J. Theis, A. R. Thompson, Chas. Dallerup, R. C. Duncan, G. H. Hoffman, W. J. Walsh, A. U. Brandt, R. Roy Cowles, Otto A. Knopp, Eugene G. McCann, W. H. Schmidt, H. S. Lane, M. E. Ryan, W. T. Tyler.

The minutes of the meeting of October 17th, 1912 were read and upon motion duly made and seconded, approved. The Chairman read the following list of applications for membership:

Adams, Ralph O.; Armstrong, T. H.; Augustine, William H.; Boyer, Henry; Baylor, N. R.; Biers, W. W.; Boden, D. A.; Bucher, Paul; Burge, J. W.; Belson, R. W.; Butler, J. F.; Brown, Earl D.; Brown, W. H.; Buell, Henry H.; Chrysostomo, Jos. Jr.; Coffin, Walter P.; Coleman, W. S.; Condon, W. S.; Conlisk, R. F.; Cantrell, R. J.; Coons, J. W.; Cankin, R. O.; De Long, Geo. B.; Deasy, C. J.; Dodge, E. E.; Daugherty, John J.; Evans, T. D.; Freygang, P. J.; Furniss, Geo. B.; Frost, C. S.; Faber, Wm. C.; Fitzgibbon, M. H.; Green, Bert D.; Greene, Oliver D.; Hixon, D. E.; Henley, E. B.; Hussey, E. O.; Helgesen, Frank A.; Hanton, A. G.; Hardenbergh, P. B.; Hummel, Fred E.; Hyde, Walter S.; Jones, Harrison E.; Jones, Will T.; Jordan, J. Chas.; Knopf, Herbert; Lanz, Geo. E.; Larabee, C. E.; Lutzi, R. P.; Mann, E. P.; McLaughlin, W. H.; Mix, Francis L.; Monahan, Edward C.; Marston, F. C.; McFarland, A.; Merrick, A. P.; Norton, R. J.; Osterman, G. R.; Page, M. L.; Porter, C. B.; Parratt, A. P.; Pearson, Geo. S.; Price, W. L.; Phillips, A. A.; Redd, Chas. A.; Robinson, R. W.; Rathjen, B. A.; Shaw, S. B.; Stephens, Thos. R.; Searle, Geo. H.; Smith, L. B.; Shipley, Paul Raven; Skewes, N. F.; Smith, Rudolph A.; Stroh, Geo. N.; Suydam, Chas. H.; Szczepanski, E. M.; Talcott, D. W.; Talcott, Frank; Unger, Cross; Varney, J. W.; Van Hoozear, John E.; Van Loben Sels, E. D.; Van Zandt, W.; Williams, Ray B.; Walsh, L. F.; Watson, J. H.; Weymouth, E. A.; Watson, Oscar J.; Wilson, James L.

The Chairman then read a letter received from the Secretary of the National Electric Light Association, calling attention to a list of lectures and papers which are being prepared under the auspices of the Lecture Bureau for use of Company Sections, and which will be referred to the Executive Committee for action on their part, with a view of arranging for certain of the lectures and papers to be read before the meetings of this Company Section.

The following report was presented by the members of the Nominating Committee:

To the MEMBERS OF THE PACIFIC GAS AND ELECTRIC COMPANY SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION.

This committee, appointed at the last meeting to nominate the officers for the ensuing year, has nominated, and submits herewith for your consideration, the following names for officers:

EXECUTIVE COMMITTEE: S. V. Walton, F. H. Varney, C. J. Wilson, George H. Bragg, R. C. Powell.

CHAIRMAN: A. R. Thompson.

VICE-CHAIRMAN: John D. Kuster.

SEC'Y & TREAS: H. Bostwick.

Respectfully submitted,

F. A. LEACH,
(Signed) L. H. NEWBERT,
C. A. DALLERUP,
S. J. LISBERGER,
H. P. PITTS.

Upon motion duly made and seconded, the report of the Nominating Committee was adopted as read.

Mr. A. R. Thompson, Chairman elect, thereupon took the chair, and adressed the members as follows:

"Members of the Pacific Gas and Electric Company Section, Fellow Employees, and Gentlemen, I express to you my sincere thanks and appreciation for the confidence reposed in me, and the honor conferred by you in electing me as your Chairman of this organization. While I fully appreciate the honor of this position, I at the same time in accepting the same do so with a full realization of the responsibilities and labors which must necessarily at the same time be assumed.

"In looking over the field here in our organization, in comparison with similar organizations in our big Eastern companies, I prophesy a most successful and helpful Local Section. Almost without exception all the big companies of the East and Middle West have organized local sections of the National Electric Light Association, all of which are doing a most helpful and valuable work both for themselves and for their respective companies. While we all realize the great work which lies before us incident to a Local Section, we at the same time are exceptionally fortunate in that we have an unlimited amount of talent and support in this great organization of ours from which to draw.

"From my personal knowledge and acquaintance with the company section movements and activities in the Eastern companies I can assure you all of its invaluable and inestimable benefits to us as employees, in addition to the great benefits resulting indirectly to our Company. This National Electric Light Association movement is a mutually beneficial one. It benefits the Employee and indirectly the Employer.

"It can readily be seen and appreciated that if each and every Employee in each and every Department should co-operate with each other for the success of that Department, and each and every Department in turn co-operate with every Department in the District, and all Districts in turn co-operate for the success of the Company in general, that the success of such a combined co-operative effort would be unlimited in its value, both to the Employee and the Company.

"The Chair must beg your indulgence in not being able this evening to make the various committee appointments, as the results of this election were entirely a surprise. I will, however, promise to give this matter, together with all other matters as regards some definite plan of action for our year's work, my most considerate and thoughtful attention in the interval between now and our next regular meeting in December. There are a number of committee appointments to be made, not the least of which is the Membership Committee, which the Chair hopes to be able to appoint immediately in order that no time be lost in the formulating and prosecuting of a most active and energetic campaign for the immediate enlisting of a large active and co-operative membership.

"While our membership at the present time is approximately 150 members, I would most strongly urge and request that all present members consider themselves a committee of the whole for the obtaining of additional members, to the end that our membership roll may reach the 500 mark by the first of the year."

There being no further business to come before the meeting, upon motion duly made and seconded, the same adjourned.

HENRY BOSTWICK,
Secretary.

The following communication has gone out to heads of departments, district managers and division superintendents of the Pacific Gas and Electric Company:

PACIFIC GAS AND ELECTRIC COMPANY.

December 5, 1912.

Gentlemen:

In connection with the Company Section of the National Electric Light Association, your attention is respectfully called to the following resolutions, which have been unanimously adopted by the Executive Committee of the Company Section, in the matter of the payment of the first year's dues by the Company, and also in the matter of attendance upon the monthly meetings of the Company Section:

"RESOLVED: That when the membership roll of the Company Section reaches 300, that the Company be not required to thereafter advance remittance account of first year's dues covering such of their employees who might desire to become affiliated with the Company Section, feeling that the many advantages to be gained by the employees being so affiliated with the Company Section, and the receipt by them of the monthly publications as well as the printed volume of the proceedings of the Convention each year of the National Electric Light Association, will more than compensate such employees for the amount of annual dues in the National Electric Light Association."

In the matter of the attendance upon our monthly meetings by such of the employees who are members of the Company Section residing within the confines of the Bay Counties, which at this time are defined as Solano, Contra Costa, Marin, Napa, Sonoma, Alameda, San Francisco, San Mateo and Santa Clara counties, the following resolution was adopted, subject to the approval of the management:

"RESOLVED: That such of our members residing in the above counties be permitted to attend our regular monthly meetings subject to the approval of the head of the department under which they might be employed, and such expenses contingent upon their attending such monthly meetings be assumed by the Company: Furthermore, that in the matter of members of the Company Section residing without the confines of the above counties, that arrangements be made whereby one employee from each District or Division of the Company be in attendance upon the monthly meeting of the section at the Company's expense; the names of such members to be selected each month by the Executive Committee and submitted to the head of the department in which such member might be employed, for his approval."

It is respectfully requested that you acquaint the employees of your Department, District or Division with the actions which have been taken by the Executive Committee of the Company Section, and in this connection your heartiest co-operation is asked insofar as lending your support by taking a personal active interest in the affairs of the Company Section and rendering such assistance as you can from time to time to the Chairmen of our standing committees when called upon by them.

The following members of the Company Section have been duly elected to serve as officers for the current fiscal year 1912-1913:

EXECUTIVE COMMITTEE: S. V. Walton, F. H. Varney, C. J. Wilson, George H. Bragg, R. C. Powell.

CHAIRMAN: A. R. Thompson.

VICE-CHAIRMAN: John D. Kuster.

SECRETARY & TREAS: H. Bostwick.

The Chairmen of the standing committees as at present constituted are as follows:

MEMBERSHIP COMMITTEE: F. H. Varney.

QUESTION BOX COMMITTEE: Chas. J. Wilson.

PAPERS & MEETINGS COMMITTEE: S. V. Walton.

EDITORIAL COMMITTEE: H. Bostwick.

Once more bespeaking your support on behalf of the Company Section, I am

Yours very truly,

H. BOSTWICK,
Secretary, Pacific Gas and Electric
Company Section of the National
Electric Light Association.

I approve the actions which have been taken by the Executive Committee of the Company Section.

JOHN A. BRITTON,
Vice-President & General Manager.

Why All Employees Should Become Interested

By HENRY BOSTWICK, Secretary.

Henry Bostwick

First—The intercourse and co-operation of employees in a work of this kind brings about an esprit de corps that cannot be obtained by any other medium.

Second—Because of the educational advantages to be gained by employees of one department becoming acquainted with the employees of other departments, which privileges are denied us in the rush of every day matters.

Third—By attendance upon and taking active part in our meetings (the business to be transacted at such meetings having to do with all branches of our service) we are brought closer to each other.

Fourth—The monthly bulletin of the National Electric Light Association and the printed bound volumes of the proceedings of the Annual Conventions of that Association contain the views of the ablest men in the business, and comprise the latest and best information obtainable concerning the industry of manufacturing and distributing electricity.

Fifth—Because such association will enable us to better qualify ourselves, so that when we go out to preach the gospel of "Pacific Service" we will know whereof we talk.

Sixth—Connection with the Company Section, aside from the educational advantages to be gained, cannot but help us to better think, read and talk, thereby not only increasing our own efficiency insofar as our services to the Company are concerned, but also bringing our organization as a whole through such intercourse and co-operation up to the highest possible point of efficiency in every detail.

Seventh—To have a successful organization we must have co-operation, as one depends upon the other; when organization and co-operation are in synchronism, that means efficiency, and when our service is efficient, that means success, and when our Company is successful, that means that our employees are equally successful, thereby better enabling us to render "Pacific Service," which is the one aim we should all strive for.

Eighth—The National Electric Light Association and kindred societies have been organized for such purposes, and the very fact that the membership of the National Electric Light Association comprises upwards of some 15,000 members should be sufficient argument to any person engaged in any branch of the electrical industry to voluntarily join its ranks when the opportunity is offered him, and thereby participate in the many good things which are being disseminated by that great organization.

Ninth—The management has sanctioned the formation of the Company Section, feeling that the many advantages to be secured by its employees being so affiliated will more than compensate the Company in increased efficiency on the part of its employees.

The above are a few of the salient reasons why all employees should become interested in the work of the Company Section, of the National Electric Light Association, and which I have endeavored to bring out as clearly and forcefully as possible.

PACIFIC GAS AND ELECTRIC COMPANY

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F. G. Drum
John S. Drum
D. H. Foote
Wm. G. Henshaw
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G. C. Holberton	Chief Engineer Stockton Water Dist.	F. H. Varney	Engr. O. & M. Steam & Gas Eng. Sect

F. G. Baum……Chief Engineer Hydro-Electric Department

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District	Headquarters	Manager	District	Headquarters	Manager
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Berkeley			Petaluma	Petaluma	H. Weber
Oakland			Placer	East Auburn	H. M. Cooper
Antioch	Antioch	F. J. Southerland	Redwood	Redwood City	E. W. Florence
Chico	Chico	H. B. Heryford	Sacramento	Sacramento	C. W. McKillip
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Contra Costa	Martinez	Don C. Ray	San Jose	San Jose	J. D. Kuster
Fresno	Fresno	M. L. Neely	Santa Rosa	Santa Rosa	M. G. Hall
Grass Valley	Grass Valley	John Werry	Solano	Dixon	C. E. Sedgwick
Marysville	Marysville	J. E. Poingdestre	Stanislaus	Newman	W. A. Widenmann
Marin	San Rafael	W. H. Foster	Vallejo	Vallejo	A. J. Stephens
Napa	Napa	O. E. Clark	Woodland	Woodland	W. E. Osborn

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Nevada (Nevada City)	George Scarfe	Standard (Electra)	W. E. Eskew

Stockton (Stockton)……J. W. Hall

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Marysville	E. C. Johnson	South Tower	A. H. Burnett
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Marin	Chas. Dallerup	San Jose	A. C. Ramstad

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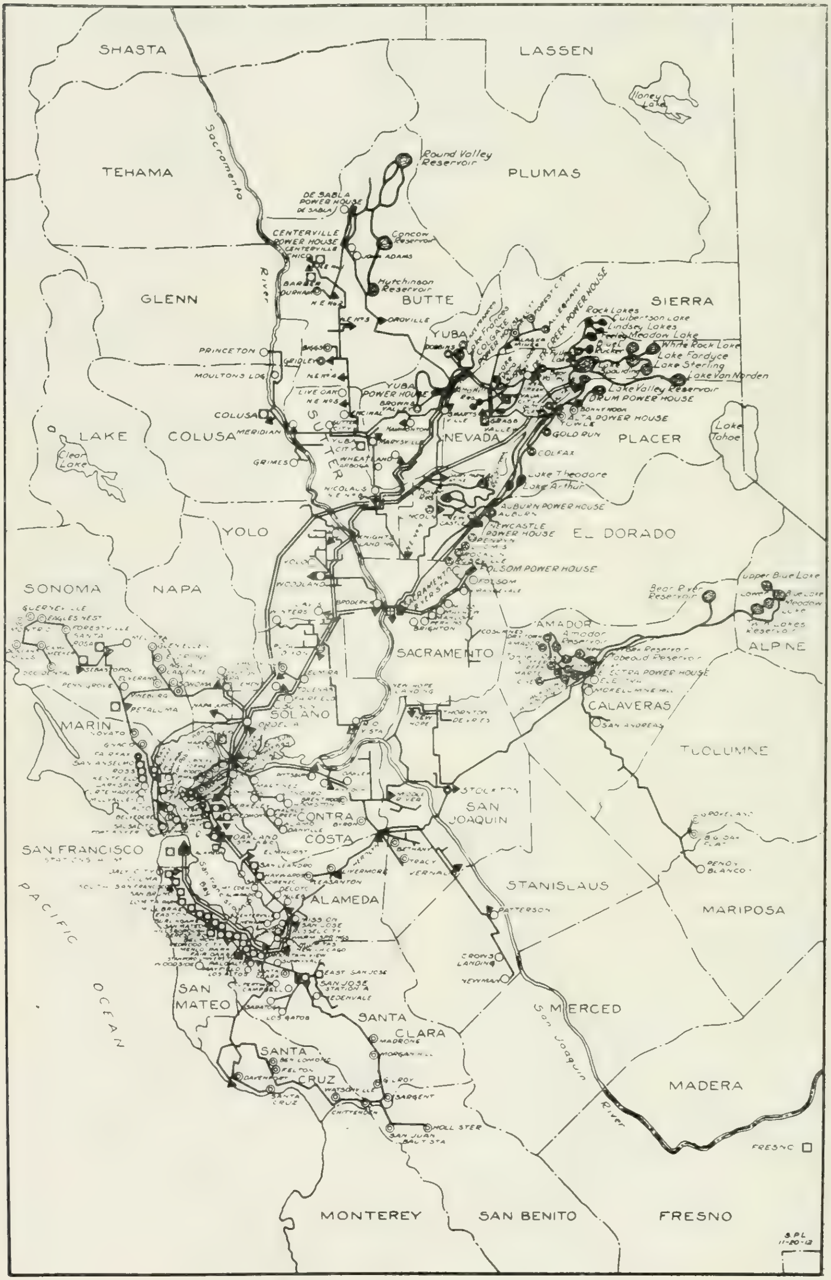
San Jose……R. H. Hargreaves

SUPERINTENDENTS OF GAS DISTRIBUTION

Oakland	George Kirk	San Francisco	D. E. Keppelman

Superintendent of Railway Department……N. J. Hullin


SHASTA
LASSEN
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
YUBA
NEVADA
PLACER
LAKE
COLUSA
SUTTER
YOLO
EL DORADO
SONOMA
NAPA
SACRAMENTO
AMADOR
ALPINE
MARIN
SOLANO
CALAVERAS
TUOLUMNE
CONTRA COSTA
SAN JOAQUIN
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
SANTA CRUZ
MADERA
MONTEREY
SAN BENITO
FRESNO
PACIFIC OCEAN
Sacramento River
San Joaquin River
Round Valley Reservoir
DE SABLA POWER HOUSE
CENTERVILLE POWER HOUSE
Concow Reservoir
Hutchinson Reservoir
COLGATE POWER HOUSE
DRUM POWER HOUSE
ALTA POWER HOUSE
Lake Tahoe
Clear Lake
Honey Lake
Lake Theodore
Lake Arthur
AUBURN POWER HOUSE
NEWCASTLE POWER HOUSE
FOLSOM POWER HOUSE
ELECTRA POWER HOUSE
YUBA POWER HOUSE
Rock Lakes
Culbertson Lake
Lindsey Lakes
Meadow Lake
White Rock Lake
Lake Fordyce
Lake Sterling
Lake Van Norden
Lake Valley Reservoir
Bear River Reservoir
Upper Blue Lake
Amador Reservoir
Tabeaud Reservoir
OROVILLE
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STOCKTON
SAN JOSE
OAKLAND
COLFAX
GOLD RUN
PRINCETON
GRIMES
S.P.L. 11-20-13

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,800 people.

OPERATES 11 hydro-electric plants in the mountains.
5 steam-driven electric plants in big cities.
16 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,775 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

There are power consumers under your line burning refuse and repairing Gasoline Engines. The refuse may be a valuable by-product. The Gasoline engine most likely costs more to repair than a bill for kilowatts.

ask HARDY.

C. E. HARDY
165 Second St.
San Francisco, Cal.

VOL. 4 JANUARY 1913 Nº 8

Pacific Service Magazine

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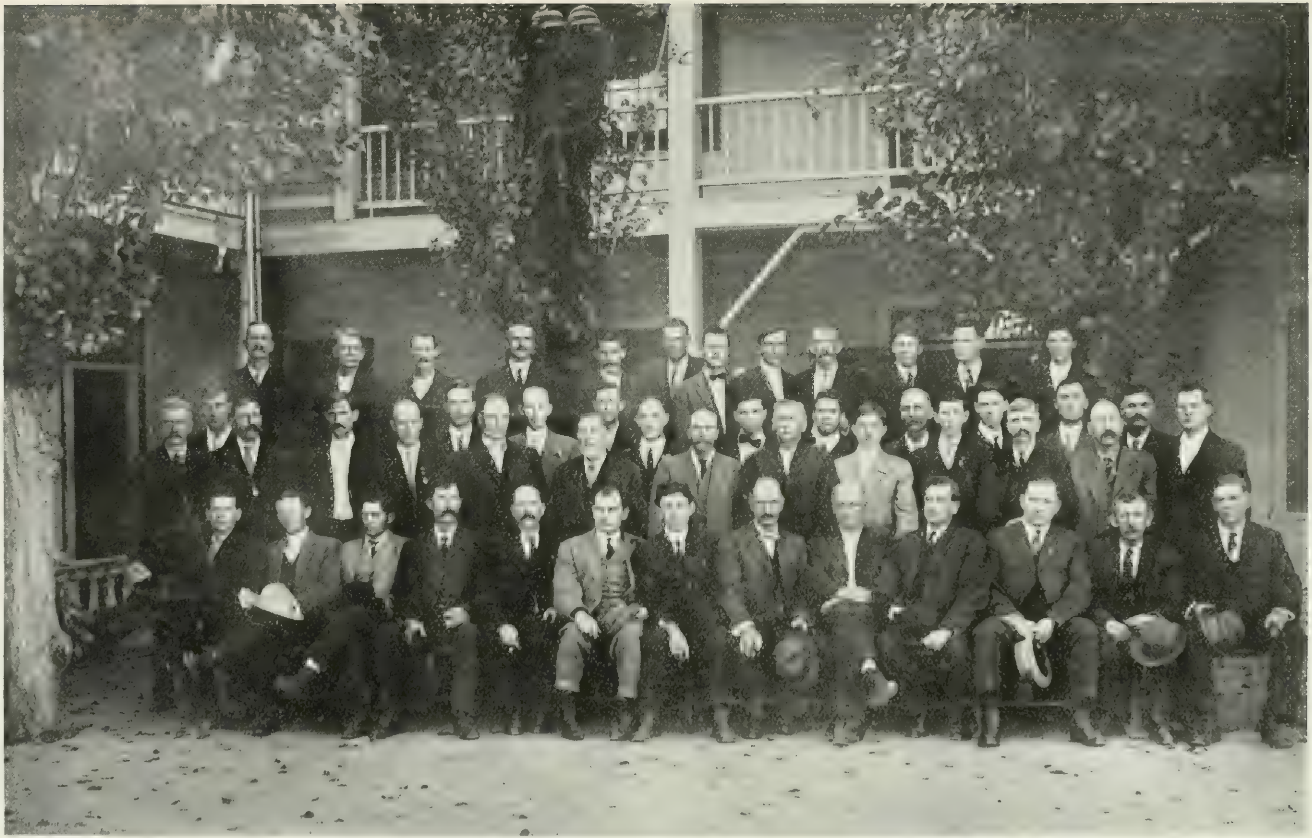


Colfax and Placer District Employees assembled at Auburn, California, November 18, 1912
For Key, see story on "Enlarging the Bear River Canal"

PACIFIC SERVICE MAGAZINE

VOL. IV JANUARY, 1913 No. 8

Enlarging the Bear River Canal

A Part of Our Development Work in the Sierras

By H. M. COOPER, Manager Placer Water District.

H. M. Cooper

An important feature of the Pacific Gas and Electric Company's development work in the Sierras which has not yet been presented in detail to our readers is the enlargement of the Bear River canal in Placer County. This in its present plan of construction and operation diverts the waters of Bear River at a point near Colfax and carries them down to the reservoirs of Lakes Theodore and Arthur, near Clipper Gap, whence they are sent out in various directions. The system of which this canal is a part supplies water for irrigation purposes to the deciduous fruit country under the foothills and furnishes the various towns of Placer County, including Auburn, Loomis, Newcastle, Penryn, Rocklin and Roseville, with the water used by them for domestic and other purposes. There is another and, at present, larger canal, the Boardman, which assists in this service, but when the present construction work is completed that will sink into insignificance by comparison.

The Bear River canal as at present constructed has a capacity of 1,500 miner's inches and takes a winding course from Colfax to Clipper Gap, making its total length about 33 miles. When reconstructed it will have a capacity of 14,000 miner's inches, or 350 second feet, while its length will be reduced approximately 10 miles by the construction of tunnels and syphons which will eliminate some of the most tortuous detours.

The demands of the Placer County farmers have been taxing the delivery capacity of this system to the utmost; but now relief is at hand. Whereas the present construction takes care of, approximately, 15,000 acres of orchard land, the new development will enable the successful irrigation of some 20,000 acres additional. This enlargement of the Bear River canal is made possible through the increased water storage now in process of development at Lake Spaulding, and, connected with it, the Drum power-house development lower down stream. It is proposed to pick up the waters as they flow from the power-house and which, under ordinary circumstances, would go to waste.

An expenditure of some $600,000 is involved and the work of construction has been going on since November. It is to be a quick job, for it must be completed by next spring in time for the commencement of the irrigation season. So there are construction camps strung along the length of the canal, and the equipment includes some 2300 men and four steam shovels, all working at record speed.

It might be well at this point to acquaint the reader with something of the early history of this canal system, which dates back to the pioneer days when California first began to be settled by the miners. As every-

Starting work on the big undertaking

body knows, the first requirement after a placer mining claim has been staked out is water. The miners of the early days had a very insufficient supply of this, so that it was possible to wash the gold-bearing soil only during the period in which the natural run-off or surface water was available. There was a dry period of several months when little or nothing could be done. So, in the winter of 1850-51 the hardy miner in his search for gold conceived the idea of bringing water from the snow-capped peaks of the Sierras to the gold deposits to be found in the gentle slopes and foothills below. That marked the beginning of what, when completed, will be one of the most wonderful irrigation schemes in existence.

The original Bear River canal began at a point opposite the town of Colfax and ended west of the town of Auburn. Its construction was started in 1851, and water was delivered to Auburn and vicinity the following year. The canal was built entirely by hand labor. The indomitable perseverance which characterized the early day settlers of this wonderful region was, to a great measure, responsible for the carrying out of the work. The canal laid out by these pioneers takes out from the rough and rocky section of the Bear River, closely follows the contours of the country, winding and twisting out of the ravines, avoiding the very roughest as well as the treacherous sliding ground, and in a way jumping from one high point to another in so doing. This early construction work commands the respect of the best engineers of the present day. Its location, grades and methods of construction have recently been subjected to a critical examination for the purpose of devising plans of improvement, in case such should be found necessary. As a result, there has been found little need of making changes from the plan as originally laid out by the men who lived and worked over sixty years ago.

Following its completion, the water from the canal was generally used for mining. However, from conversations I have had with some of the early settlers who are still living I have learned that some water was used for irrigation during the very earliest history of the canal. Then, gradually, as each placer claim became worked out, fruit-growing became the more important industry. Previous to the advent of irrigation, we are informed, with the sole exception of its grain fields, Placer county's plains and foothills presented quite a desolate waste, producing only grasses and such vegetation as usually follows the rainy period and thrives as long as nature provides moisture, and which blooms and seeds in its dwarfed state during the hot summer. Higher up, and away from the plains, the small hills were covered with pines, oaks and various trees which have since given place to orchards, vineyards, dairies and farms. Man has utilized the storage water for irrigation and to assist nature in producing the golden fruit which has made California famous and which, by the way, has done more to upbuild the State than the gold which was taken from the earth.

Today may be seen the prosperous homes of orchardists and farmers, with trees and vines bearing the fruit that the Eastern market demands. Up in the high Sierras the snow is packed and frozen and, in many instances, fills the deep, rocky canyons, and if Dame Nature were left to her own devices the snow waters would in due course contribute to a Spring freshet, raising the rivers to a point which would threaten the levees and, with them, the lives of many inhabitants. But man in his ingenuity picks up this snow in its watery form, together with the flood waters conserved in the artificial lakes, to be drawn upon at will during the long hot and dry months of the year, conducted through the canal system into the power-house reservoirs and thence to the generators in the power-houses themselves. This convertible power makes electricity, and the danger of the Spring freshet is averted.

Ultimately, as a result of this storage of water, the State of California will not only benefit by the generation of electricity and

One of the four steam-shovels at work

Hand-labor used in construction work

the irrigation of her arid lands, but the water-control will have an appreciable effect on the navigable streams, especially such streams as are affected by the dry season.

Coming back to the present day, this enormous increase in the capacity of the Bear River canal involves its enlargement to such an extent that when completed it will be 8 feet deep, 10 feet wide at the bottom and 18 feet wide at the top, measuring from berm to inner bank. For the purpose of reducing future water losses by reason of evaporation, seepage, etc., the plans provide for the cutting of three tunnels, each 7 feet high by 9 feet wide. Two of these, the upper and lower Cortopassi, are to be 1930 and 1700 feet in length, respectively; the third, emptying into the Boardman canal above Lake Theodore, will have a length of 1200 feet. This enlargement will make the Bear River canal the main artery supplying the two highest and largest reservoirs in the district, Lake Theodore and Lake Arthur. The distribution of the additional water will necessitate the enlargement of practically all the canals in the present system and, also, the construction of many extensions and laterals.

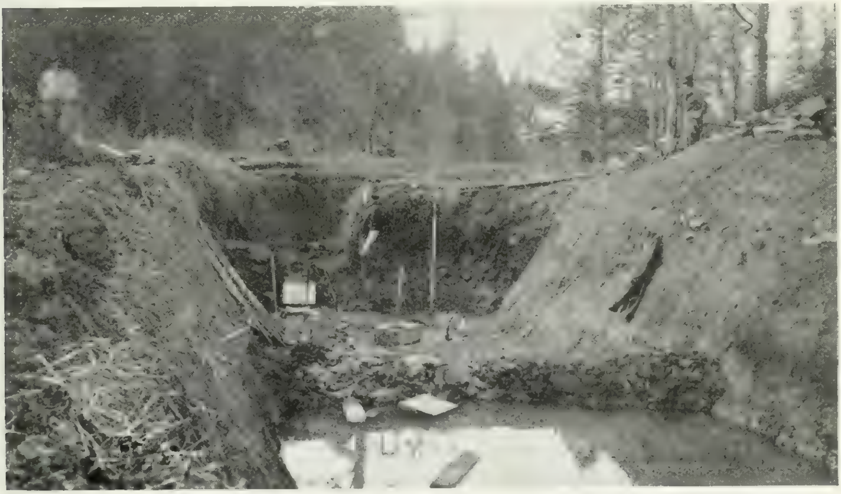
The irrigable land under this system will comprise upwards of 90,000 acres. It lies in the form of a delta with the American River to the east and the Bear and Feather Rivers to the north and west. As before stated, the system includes the Boardman Canal which, after leaving Lake Theodore, continues in a southwesterly course to a point three miles east of Roseville and supplies water to that portion of the delta running parallel with the American River. From the Boardman there are many branches striking off, and in their order, going downstream, the most important are: the Auburn, Freeman, Shirland, Newcastle, Greeley, Rock Springs, Red Ravine, Perry and Baughman ditches. These, with their laterals, represent a total distance of 80 miles.

Then there is the Fiddler Green canal, beginning at Lake Arthur and continuing in a westerly direction to a point north of Rocklin, and which supplies the central por-

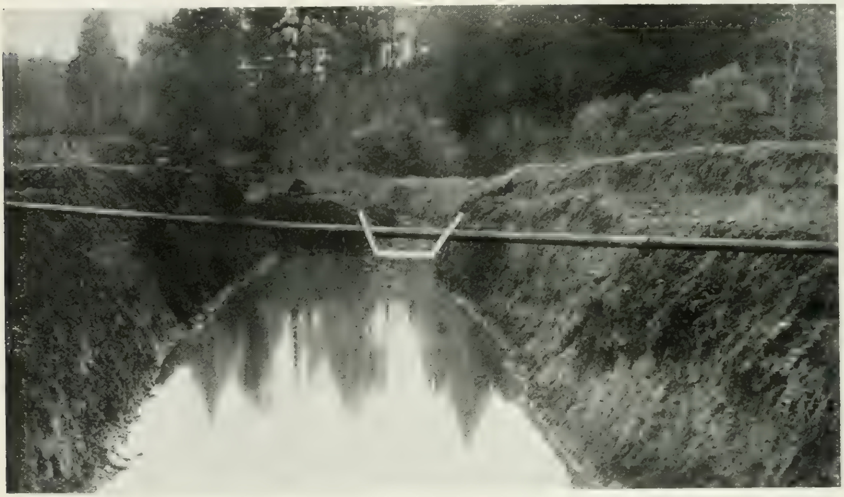
Old canal cleared, ready to be enlarged

tion of the irrigated district. This canal also has several branches, such as the Ophir, Dudley, Banvard, Antelope, Penryn and Caperton, which, together with their laterals, give us a stretch of 65 miles.

The Gold Hill canal system may be considered separate from and independent of the other two canals, although the water is obtained from the same storage supply, it being diverted directly from the Bear River



Cross-section of the canal, showing the old and new widths



Enlarging the canal—water shown in this picture is three feet deep

at a point 12 miles downstream from the head diversion dam of the Bear River canal. Should occasion demand an additional supply of water this may be diverted from our Boardman or Bear River canals. From Bear River the water is taken into the Orr Creek reservoir for regulating purposes, whence it flows in a westerly direction and supplies the district lying between the Bear River and Lincoln. The important branches of this canal are the Camp Far West, Whiskey Diggings, Valley View and Lincoln, which, with their laterals added, make up a total distance of 70 miles.

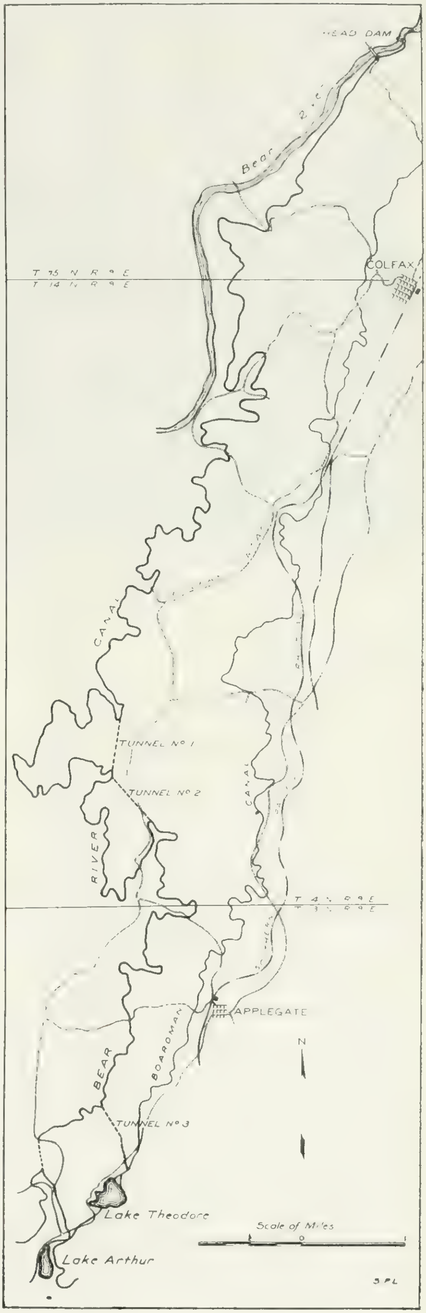
By the enlargement of the Bear River canal it is proposed not only to increase the capacities of the present distributing system but, where feasible, to extend the old ditches and construct new ones and in a general way supply that portion of the irrigation district which up to the present time has been impossible of development owing to limited storage facilities. With this increased water supply available our present consumers will be justified in increasing their irrigable acreage, while new land may be planted by new owners to its fullest capacity of production without fear of restriction insofar as available water is concerned.

Just what this development will mean eventually to the State, in general, and to Placer County, in particular, we may well hesitate to forecast. However, it is safe to predict that the most wonderful improvements will result if we may take the following facts as a basis from which to make our deductions:

Placer County fruit shipments for the year 1912 totaled 2900 cars. Homeseekers as well as fruit-growers are now making extensive purchases of land for cultivation, evidently in anticipation of the opening of the Panama Canal and its celebration in San Francisco in 1915, which undoubtedly will bring about changes in conditions that at this time cannot even be conceived by the most enthusiastic. Eastern demand for California fruit is becoming greater each year. The time is coming when London will be a great consumer, for when the canal is opened the journey by water from San Francisco will occupy but three weeks.

Then, there is the State Highway which is building from the western end of Placer County. This will bring about the disappearance of the chaparral, manzanita and pine in the higher hills in favor of Bartlett pears, Hungarian plums and apples. The native trees of the lower altitudes will give place to oranges, peaches, deciduous and citrus fruits in general. Most of this soil requires irrigation in order to crop a standard marketable fruit, and the value of one miner's inch of water for irrigation purposes depends entirely upon the depth of the soil, location and kind of crop to be planted. However, by averaging water deliveries in the total cultivated area we conclude that this amount of water will irrigate five acres. Our standard of measurement is the California standard miner's inch which delivers 1½ cubic feet per minute regardless of the shape of the orifice, delivery to the consumer made at the turn-out on our canal. To check the accuracy of these water deliveries an actual volumetric measurement is made, thereby getting definite results in a practicable way.

As stated above, the enlargement of the Bear River canal is one involving the expenditure of a considerable sum of money and is the direct result of the development of Lake Spaulding and the Drum power-plant. An enterprise of this kind would not be possible were it not for the large amount of money public service corporations of the magnitude of the Pacific Gas and Electric Company are enabled to raise by borrowing. While this may be an age of conservation it is also an age of combination. If it were not for the skill that can be hired and the labor that can be employed and the material that can be bought by the expenditure of millions of dollars, the effect of a snow-storm on the summit of the Sierras could never be utilized for the generation of electricity and, by means of this useful as well as mysterious commodity, the reclamation and irrigation of non-bear-



New canal in course of construction

ing lands to transform them into revenue-producing orchards.

The work we are carrying on just now is generally considered to be difficult, owing to the fact that actual construction can be carried on only during the winter months, when storms are prevelant. For, during the dry or summer season the canal on which we are working is called into requisition, in conjunction with its sisters, the Gold Hill and Boardman canals, for the purpose of carrying water from our storage system up above to the several regulating reservoirs and distributing systems, whence it is sent out for immediate use, seven cities and towns being supplied for domestic and irrigation purposes as well as the orchard district, which, as before stated, amounts to some 15,000 acres at the present time, but will be very much enlarged when our work of expansion is completed.

Accompanying this article are a number of views showing the work in progress on the Bear River canal. There is also a map which shows the course of the canal as originally constructed with the cut-offs that will be made under the new construction. As already noticed in the December number of the Pacific Service Magazine, there was a get-together gathering of the Colfax and Placer District employees at Auburn, November 18th, and a picture of the crowd is presented herewith. For the benefit of those of our readers who are not personally acquainted with all our good fellows the writer furnishes the following key:

Top Row, reading from left to right: G. A. Wilkie, F. D. Rollins, J. H. Carr, A. C. Schroeder, Geo. Haven, J. E. Barieau, E. N. Murphy, H. Tudsbury, J. C. Feeley, John Spencer, A. L. Trowbridge and Chas. Kerr.

Second Row: A. Olsen, J. C. Jones, Geo. Colwell, A. A. Halliker, K. Corbin, K. Wilkie, A. P. Clark, J. L. Elder, G. W. Mills, A. E. Gilkey, W. M. Roberts, J. W. Reed, Tom Perry, S. A. McCrary, A. D. Lininger, H. C. Peterson, L. E. Luther, W. Keskey, H. S. Wilson, Dave Jones, J. A. Haines, C. A. Waite, Z. Kutschker, W. E. Bellows.

Third Row, seated: Geo. Atwood, J. W. McCrary, A. G. McCrary, E. E. Fletcher, F. A. Philbrick, W. Corbey, Fred R. George, R. E. Linder, W. E. Lininger, H. M. Cooper, P. M. Downing, Geo. E. H. Betton, J. K. White.

How Yuletide Was Enjoyed Up Country

"Pacific Service" Employees in Camp and at Power-Plant All Made Merry in the Old Light-Hearted Way

Christmas at Lake Spaulding

We have begun a new year. All the joys and sorrows, all the trials and pleasures of old 1912 are but memories.

Some of these memories we would forget; others we would have with us always—but there are none more vivid and pleasing to our memories than our Christmas eve at Lake Spaulding.

Our memory will ever and again, in the years to come, flit back to the big smoker held in the spacious dining room at the main camp, where were congregated on that beautiful December night a multitude of men, each man an individual unit in the mechanism of this wonderful undertaking of throttling the waters which the sedate and mighty Sierras so generously contribute.

There were lumber "jacks" and railroad "shacks,"
There were tinners, there were "skinners,"
There were bakers, there were waiters,
Conveyormen, surveyormen;
There were cooks and there were "flunkys,"
And the men who run the donkeys,
There were "bohunks," there were "muckers,"
Timber fallers, limbers, buckers;
There were foremen, there were bosses,
And the men who drive the "hosses,"
There were concrete men—compressor men—
Electricians came and lesser men;
Blacksmiths, carpenters and raftsmen,
"Supers," "pencil pushers," draughtsmen,
There were miners, there were tunnelmen,
Also quarrymen and powder men.
All the miners came from Arndt,
All the lumbermen from Haney,
The quarrymen from Griffith,
And the muckers from Delaney.
Manning, Zachary and Wardlaw,
Each had men join in the pow-wow
And conspicuous at the smoker
Was the smiling face of Walker.
Missed by most upon this Yuletide
Was our good old friend George Burnside,
Jolliest of toasts was drunk
To our able Chieftain "Dunc."

It was a joyous time for all, this Christmas Eve. There were men of every class and clime and vocation congregated together, all intent upon but one thing—to make it the most enjoyable evening of the year.

Master of ceremonies Sam Wardlaw saw to it that there was "something doin' " every minute, and at every intermission would be right there on the job with that line of talk that we all have learned to know so well. And as chief steward he saw that everyone was amply supplied with cigars, pipes, tobacco, sandwiches, fruit, coffee, cake and cider. "Who ever heard of a Christmas without cider?" asks Sam.

The evening's entertainment was opened by F. Krietzinger (a native Boer of South Africa), relating (at length) Boer history from its origin to the present date, also rendering Boer and Zulu Christmas carols in the native tongues.

A. Abbott rendered several selections in his beautiful falsetto voice.

Dud. Clark, (formerly of the N. W. Mounted Police, recited a tale of the plains, entitled "The Cowboy and the Wheel," which received such applause that "Dud" was forced to shamefacedly admit that it was the only one he knew and that he had never learned a "come back," so was mercifully excused.

Harry Mendell, a clever vaudeville performer from Camp No. 2, was booked for several numbers, but as the turkeys for the Christmas dinner failed to arrive on the scene until the very last minute he was forced to spend the greater part of his evening in separating the "gobblers" from their coats of "male."

After several hours had been spent in a most pleasurable manner and on the atmosphere wafted the aroma of innumerable "Cubanolas" and everyone was enthused with pleasure and excitement, official announcer Arndt informed the merry crowd that the real excitement of the evening had only just begun.

The crowd "tumbled" at once, and in the twinkling of an eye the deck was cleared for action and a ring was built for three of the fastest boxing bouts ever witnessed in the heart of the Sierras.

The first preliminary was a fast four round go between Joe "Watermelon" Ryan, "the scrapping biscuit shooter," and "Kid" Saunders, the clever glove artist from the tunnel. Altho' Saunders had a shade the best of it all the way, Ryan had a "haymaker" that would have brought home the candy had he landed at an opportune moment.

The second preliminary was also a four round go and was pronounced by all as being the best exhibition of the evening.

When the "Oklahoma Sooner" and the "Fighting Wood Butcher" sprang from their corners at the sound of the gong everyone knew that they were to be treated to something exceptional in the art of "fisticraft", and they were not disappointed in the least.

They mixed it right from the start and although the "Carpenter" was continually hammering the ten pennies home and occasionally would drive a regular old sixty penny bridge spike, he didn't do all the fighting by a long shot—not yet. The "Sooner" was there a million and was the aggressive one all the way. The "Sooner" got in sooner than the "Carpenter" liked at all times, and if the "Sooner" had been a little sooner sooner we would sooner believe that the decision would have been different. The "Carpenter" won the decision on points—the main one being that he was a direct importation of the Emerald Isle and Referee Delaney didn't have the heart to turn down a fellow countryman.

The main event, a six round go between "Bulldog" Sharp, the "pride of the tunnel," and "Kid" Homer, "the terror of the tall timber," was rather a disappointment inasmuch that after two rounds of champion, belt-winning exhibition Homer was suddenly stricken with cold feet and quit amid the disgusted jeers of the disappointed onlookers.

"Bill" Arndt, the chief promoter of the three goes, is "there" when it comes to picking winners, as some of us have firmly impressed on our memory when we feel our pocketbooks.

Burt Delaney, who acted as referee, is an old timer at the game and when his commanding voice demanded that they "break" they "broke"—that's all.

Deputy Sheriff Teagarden and "Pencil-pusher" Baldwin, the official timekeepers, did very well for amateurs, but we can say to their discredit that on several occasions (six or seven maybe) they became so interested in watching the participants "mixing it" that they let some of the rounds go four or five minutes longer than they ought.

When the bouts were over and the pros and cons of the evening's entertainment were thoroughly discussed over coffee and sandwiches, and when a last round of cigars had been duly lighted, each departed for his respective bunkhouse with that feeling of peace and contentment that only Christmas time can instill and each impressed with the fact that Yuletide is not for the little ones alone.

And speaking of the little ones—they had their Christmas also. Christmas night was set aside for them and the married folks. All came to the dining room in the Administration Building, which was profusely decorated with evergreens from the mountains and artistically arranged by Superintendent and Mrs. Duncanson, Chief Electrician and Mrs. Crabbe and Secretary Jack Bonhag, and with the tree illuminated in a fitting manner, made the room a beautiful Christmas picture.

And outside in the silv'ry moonlight loomed—
"The palaces of Nature, whose vast walls
Have pinnacled in clouds their snowy scalps
And throned Eternity in icy halls
Of cold sublimity, where forms and falls
The mighty avalanche—the thunder bolt of snow."

But inside all the joy and cheerfulness of Christmas abounded, led by Supt. Duncanson, whose love for children made the evening a most enjoyable one for them and the older ones as well. He explained to them their new games and taking them on his knee told them wonderful Christmas tales and played father to them all. The time was spent in games and singing, and everyone joined in the spirit of the evening.

And after the distribution of the presents to the little ones—those present and those unable to come were all remembered—Mr. Duncanson entertained the company by relating several tales—true ones—of grim facts that this extraordinary, lion-hearted man has lived. Everywhere the genial Western spirit was predominant and here, in the heart of the Sierras, we know, we feel that—

Out where the hand clasps a little stronger,
Out where a smile dwells a little longer
There is where the West begins.
Out where the sun is a little brighter
Where the snows that fall are a trifle whiter,
Where the bonds of home are a wee bit tighter,
There is where the West begins.

Out where the skies are a little bluer,
Out where friendship's a little truer,
There is where the West begins.
Out where a fresher breeze is blowing,
Where there's laughter in every streamlet flowing,
Where there's more of reaping and less of sowing,
There is where the West begins.

Out where the world is in the making,
Where fewer hearts with despair are aching,
There is where the West begins.
Where there's more of singing and less of sighing,
Where there's more of giving and less of buying,
Where a man makes friends without half trying,
There is where the West begins.

F. E. BALDWIN.

Old Kris Kringle at Division 3, Colfax

Would you be surprised if "Old Kris Kringle" should make himself known in a construction camp, or would you expect to find him there? If you would not expect him there, then be surprised, and if you would expect him there, be surprised also, for your expectations have been more than satisfied.

In the eyes of our superintendents and officials, the laborers, or so-called Bohunks, are not mere machines or animals from which all the power or energy is extracted and then allowed to rust or rot. Our leaders are as attentive to these men as marksmen are to their rifles, so that when called upon to perform their duty the instructors or aimers are sure of their ability or preciseness.

A look at the well-set tables with their greens and red berries, and then a glance at the menu of Division No. 3, would make one believe that the day does not come in vain for the laboring construction man, especially those in the employ of the Pacific Gas and Electric Company. To those who could work and partake of the edibles of the following menu on the same day was given time and half:

Oyster Soup
Celery
Roast Pork Ribs of Beef
Cranberry Sauce
Green Peas String Beans
Mashed Potatoes
Plum Pudding Custard Pie
Oranges Apples
English Walnuts
Coffee

Nature contributed gloriously to the season by one of its most beautiful California days.

Very little is known as to the manner in which the office help and the residents of Colfax spent the holidays. Most of them declared they had a lovely time and it was not necessary for some to declare it—it was easily seen in their faces the next day.

JEROME BARIEAU.

A Christmas House Party at Electra

A turkey dinner was given at Electra Club House, on Christmas day, to the employes and their families of Electra.

Dinner was served at 12:30, to about twenty-five guests, which was greatly enjoyed by all.

House Party at Electra

Mrs. Eskew's Christmas Tree

After dinner was finished every one repaired to the sitting room, where cards and other amusements were indulged in for about an hour, when suddenly Santa Claus made his appearance and summoned every one to the billiard room, where a beautiful tree, laden with presents was awaiting them.

Each and every one received a present. When all the presents were distributed, Santa Claus bid every one adieu, much to the disappointment of the little ones.

The remainder of the day was spent in playing cards. The guests departed about 5:30, every one with a feeling that they had spent a most enjoyable Christmas day.

W. E. Eskew.

How the Holidays were Spent at Colgate

Christmas dawned clear and cold at Colgate, and those whose duties did not necessitate their rising early were quite content to remain in bed until the late morning sun took the chill off the air.

A very quiet Christmas it was, in a very quiet place, the principal event of the day being the arrival of the mail, when everyone was on hand to get his share of Christmas greetings and packages from friends and home folks living in more favored parts of the country. The kiddies at Colgate and the various flume and ditch camps had their Christmas trees and stockings, and great was their wonder and joy at the presents and good things to eat that Santa Claus had brought them. Nor were the older ones averse to partaking plentifully of the good things in the eating line, and the tender and toothsome turkey was much in evidence in all parts of the division.

Everyone at Colgate and all the residents of "Cottage City" partook of turkey dinner at the Martin House. The clubroom was the center of attraction for those at Colgate and nearby during the evening. It had been very tastefully decorated by the ladies and operators and presented a very pleasing and Christmas like appearance with its branches and festoonings of red berries, ferns and mistletoe. The evening was very pleasantly spent with various games, guessing contests, dancing, music and singing. Refreshments were served during the evening and, finally, in the wee sma' hours when good night was said, some had only time for short naps before going on shift while others had time during the rides and walks home to think over whether it was worth the loss of sleep and the feeling of the morning after. But then, Christmas only comes once a year.

New Year's day was quite uneventful, but the New Year was ushered in with much vim and enthusiasm. As is customary, noise was the chief ingredient of the evening fun, and we are willing to wager that for the same space and number of persons nothing in San Francisco could surpass the noise made or amount of confetti and serpentine scattered around.

Refreshments there were, but what stood out most prominent in the eating line was the popcorn that Foreman "Jake" Becker made for us over the coals in the fireplace. It was A1 popcorn and plenty of it. "Jake" should bid for the concession in 1915.

The Holidays are over. Everything, and everybody, let us hope, is back to normal again. Left with us are the memories and the bills that are yet to be paid.

M. P. Werry.

A Royal Good Time at de Sabla

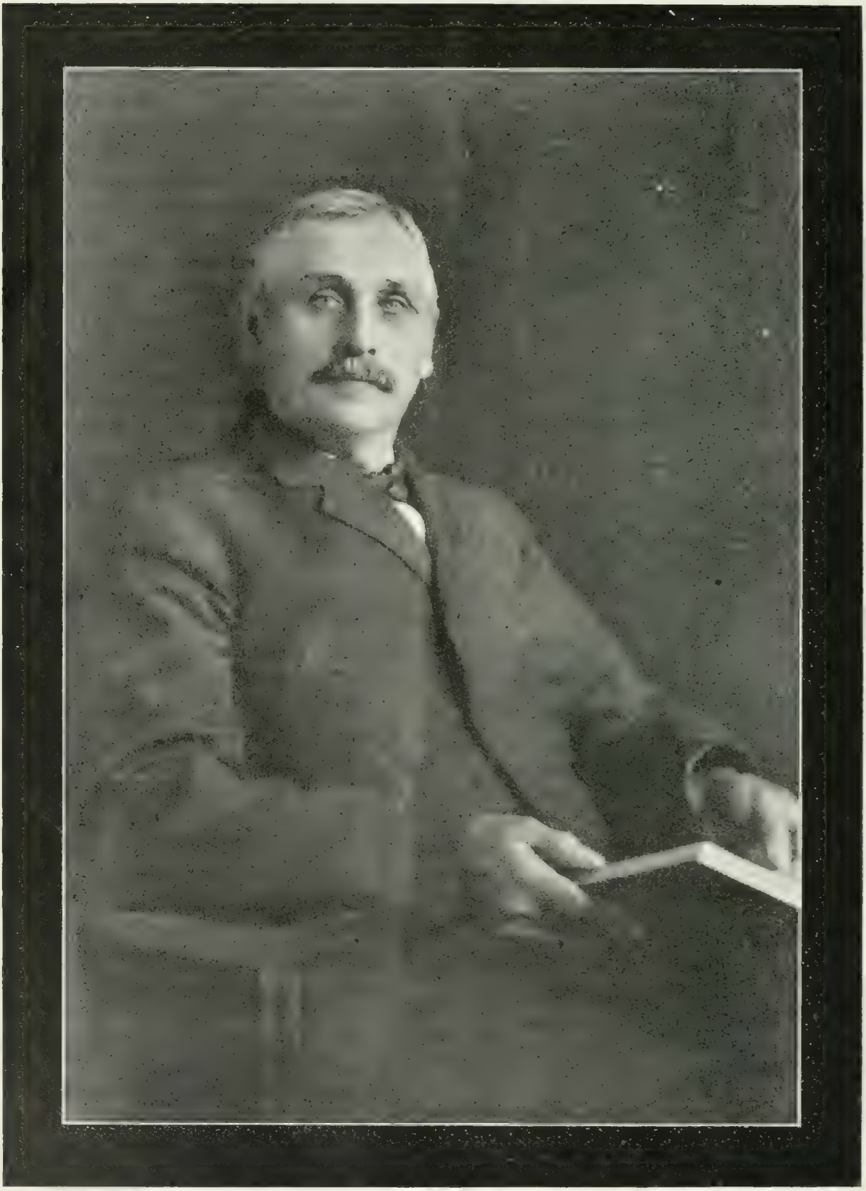
On Christmas eve, the ladies at Camp No. 1 had a large Xmas tree installed in the dining room of the boarding house, primarily for the benefit of the children in the division, but to which everyone was invited. The tree was artistically decorated, highly illuminated, and loaded with presents. Everyone was remembered, from the smallest tot to the oldest man in camp. After the presents had been distributed a jolly evening was spent, with stories, songs, and music.

Through the efforts of Mr. Dooley, powerhouse foreman, an excellent dinner was served at De Sabla, to which everyone did full justice. Realizing that Xmas comes but once a year, the chef did himself proud and furnished an exceedingly appetizing menu, regardless of expense.

MENU
Oyster Soup
Roast Turkey Cranberry Sauce
Creamed Cauliflower Mashed Potatoes
Oyster Patties
Celery Salted Almonds Olives
Hot Mince Pie Fruit Cake
Candy and Nuts Apples and Oranges
Tea Coffee
Cigars

Every employee with the exception of the operators on shift was given a day off. The boys appreciated the service and consideration shown them, and rendered a rousing vote of thanks to "Pacific Service."

I. B. Adams.



C. H. Hammond

IN MEMORIAM—CHARLES HERBERT HAMMOND

BORN OCTOBER 24, 1850 DIED DECEMBER 14, 1912

It is only a few days since our friend was among us with cheery greetings, and now he is gone. Our friend has been taken from us, but the benefits of his friendship will always remain with us.

Charles Herbert Hammond was born at West Gouldsborough, Maine, October 24, 1850; and his boyhood days were spent there. At the age of twenty he shipped as a cabin boy and followed the sea for three years. Finally landing in San Francisco, he decided to make California his home. He was variously employed until 1877, when he became a lamplighter for the San Francisco Gas Light Company. In those days the streets were lighted by flat flame burners in old-fashioned square lanterns. Hammond liked this work, and liking it he made a success of it, and so familiarized himself with the location and proper care of the street lamps of the city that upon the death of David P. Marshall, in 1894, Hammond succeeded him as Superintendent of Lamps.

During the year 1900 all the lamps in San Francisco were changed to modern boulevard lanterns, equipped with incandescent gas burners, and the operation and care of these new lamps devolved upon the Welsbach Street Lighting Company of America. But this company so much appreciated the splendid business qualifications of Charles Herbert Hammond that he was appointed the representative of the company in California with the title of Superintendent, which position he held until his death.

At the time of the earthquake in San Francisco the city was lighted by 5,505 gas lamps, and the effect of the earthquake and subsequent fire was destructive, particularly to glassware and mantles; but by heroic work and intelligent method 2,193 lamps were rehabilitated in the unburned district and lighted May 12, 1906, all in the short period of twenty-four days. This was indeed a boon to the gloomy city, dispelling darkness and bringing a feeling of safety to its people. All credit is due to Mr. Hammond for this fine piece of work which he alone was competent to do. Beginning as a lamplighter, he sooned learned the art of courtesy and promptness, and the importance of little things, and as he rose in his chosen vocation until he became an employer of men, and supervisor of their work, he did not change.

The lamplighters of San Francisco loved him and respected him. His associates in the Pacific Gas and Electric Company held him in high esteem and valued his friendship. The people of San Francisco have lost a benefactor who was only known to many of them by the silent work of his hands.

Mr. Hammond is survived by a daughter, Dr. Edith Hammond Williams, who was lovingly devoted to him and of whom he was justly proud for her eminence in her chosen profession. He died at her home in San Francisco, Saturday, December 14, 1912. The funeral services were presided over by the Rev. Bradford Leavitt, who closed his eulogy by reading the following beautiful poem by Mary Mapes Dodge:

THE TWO MYSTERIES

In the middle of the room, in its white coffin, lay the dead child or nephew of the poet. Near it in a great chair sat Walt Whitman, surrounded by little ones, and holding a beautiful little girl in his lap. The child looked curiously at the spectacle of death and then inquiringly into the old man's face. "You don't know what it is, do you, my dear?" said he. "We don't either."

"We know not what it is dear, this sleep so deep and still,
The folded hands, the awful calm, the cheek so pale and chill,
The lids that will not lift again, tho' we may call and call,
The strange white solitude of peace that settles over all.

We know not what it means, dear, this desolate heart-pain,
This dread to take our daily way and walk in it again.
We know not to what other sphere the loved who leave us go,
Nor why we're left to wonder still, nor why we do not know.

But this we know: our loved and dead, if they should come this day,
Should come and ask us "What is Life?" not one of us could say.
Life is a mystery as deep as ever death can be,
Yet, O, how sweet it is to us, this life we live and see!

Then might they say—these vanished ones, and blessed is the thought—
"So death is sweet to us, beloved, tho' we may tell you naught:
We may not tell it to the quick—this mystery of death—
Ye may not tell us, if we would, the mystery of breath."

The child who enters life comes not with knowledge or intent,
So those who enter death must go as little children sent.
Nothing is known. But I believe that God is overhead,
And as life is to the living—so death is to the dead."

E. C. JONES.

"Pacific Service" Operates the Geary Street Road

"Pacific Service" plays an important part in the operation of the new municipal street railroad in San Francisco which started running last month.

As is generally known, our Company was the successful bidder for the contract to supply "juice" for the operation of this road. And, in order to insure the traveling public uninterrupted service of the highest quality, it was found necessary to make considerable additions to the equipment at two of the company's sub-stations, Station "G" at Ellis and Broderick Streets, and Station "C" on Jessie Street between 3rd and 4th. At the former station, which is the nearest to the heavy traffic—center of the road, was installed 1,500 kilowatt capacity in motor-generator sets, divided into two units of 1,000 and 500 kilowatts, respectively. From this place, at the present time, three line-feeders have been carried out under ground, supplying different sections of the trolley system, while other feeders have been provided to take care of the increasing load. At Station "C" one 500 kilowatt set has been installed up to the present, while another of 1,000 kilowatt capacity is on the way and will be ready for service at an early date. From this station but one feeder has been run at present, but provision has been made for others to take care of the heavier service that will follow the railroad's extension to the Ferries.

Each machine and feeder has its switchboards which contain the most modern switching and safety devices as well as instruments. A feature of the installation is the metering system. The current is measured with the most modern types of meters. The current is metered as it enters the motors and, in turn, is again metered on leaving the generator side. Each feeder also carries its own meter.

Thus is "Perfect Service" insured.

ITEMS OF GENERAL INTEREST

Mr. Geo. C. Holberton, our genial Manager of the San Francisco District, was the subject of a complimentary write-up in "Town Talk" in its issue of December 14th, being Number 14 of the series of "Varied Types" depicted by that enterprising journal.

The writer, Mr. Edward F. O'Day, based his article upon a luncheon at the St. Francis at which Mr. Holberton addressed a number of prominent business men and journalists upon "Pacific Service," its properties and developments. Mr. W. D. Ryan, the famous eastern electric lighting expert, who lit the Panama Canal and is engaged just now in studying the lighting problem for the Panama-Pacific Exposition, was quoted in the article as thus addressing Mr. Holberton at the conclusion of his lecture:

"I have had a good deal to do with power and lighting plants in my day, and have just come from the Panama Canal where they develop power and go in for lighting on rather a large scale. But I want to say that the power and lighting system which has been shown in these pictures is, to my mind, the greatest in the world."

The article proceeded to sketch Mr. Holberton's career from its beginning, and by way of personal description said:

"Mr. Holberton is not a lecturer. He doesn't make a practice of coaxing a story from screen pictures while other people are dallying with the salad. But Holberton is a Pacific Gas and Electric man. He is an enthusiast for what you see described on the more or less outlawed billboards and in the street cars, and in the display advertisements in the newspapers as 'Pacific Service.' There is an esprit de corps in the gas company, a pulling all together not as common as it might be in many big industrial corporations. One of the results of this is that everybody from General Manager Britton down has a lot to tell the public and does not hesitate to mount the platform for the purpose of imparting it. Mr. Holberton rather enjoyed giving that lecture. It was diversion for an exceedingly busy Chief Engineer, and it was gratifying to elicit such a nifty compliment in such a public manner from the man who lit the Big Ditch. After all, work is fun when you approach it in the proper spirit."

The "Wasp" of the same day's issue gave Mr. Holberton a clever write-up in which the statement was made that his lecture opened the eyes of his audience to the enormous importance of the operations of the Pacific Gas and Electric Company.

"It was a revelation," said the Wasp, "to most of the gentlemen who listened to Mr. Holberton's lecture that California has progressed so rapidly in the development of hydro-electric power, that before long this wonderful State of ours will be as noted for its electrical advancement as for its incomparable superiority in horticulture and viticulture. While the development of these industries has taken two generations, the harnessing of the electric power of the mountain streams of California to the manufacturing, lighting and heating plants of the cities of our State has been a work of magic celerity."

In its efforts to follow the most advanced methods for the care of its injured employes the Pacific Gas and Electric Company has purchased a number of Draeger pulmotors for use in its principal districts.

These appliances have proved wonderfully successful in restoring suspended respiration due to electric shock, gas asphyxiation, drowning and other causes. In many cases persons given up for dead have been restored to consciousness as late as an hour after their injury, and there are cases on record where three or four hours elapsed before treatment.

This wonderful contrivance was invented by a famous German physician. It has been tested most successfully all over the world. It consists of a narrow wooden box containing an oxygen inhalation apparatus, consisting of a steel oxygen cylinder containing 11½ cubic feet of oxygen and connected with a pressure reducing valve which, in turn, is connected with an injector. The latter has the property of drawing in a large volume of air with a certain force of suction and propelling that air forward with equal force through a flexible tube in front of the ejector. This suction and delivery injector, therefore, serves as a motor, alternately filling the lungs and emptying them by suction, and no injury to the lungs can be produced by either function of the apparatus working in this manner.

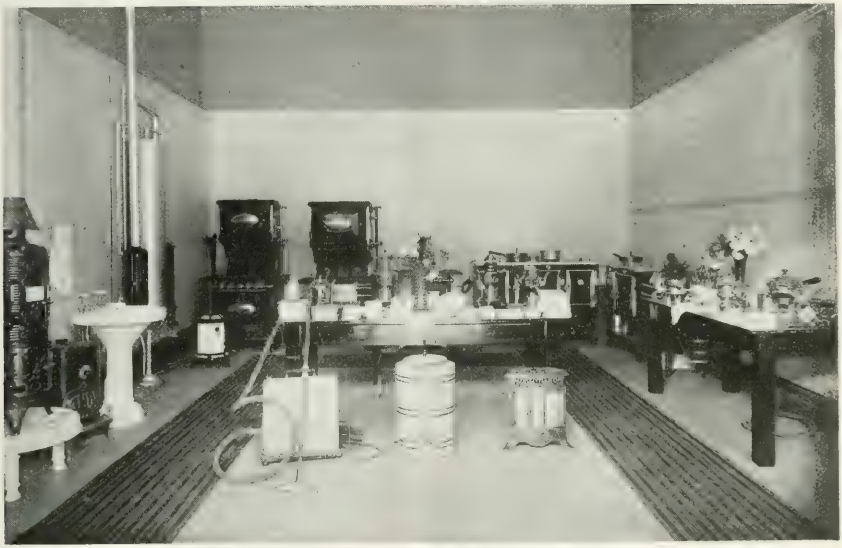
On the basis of existing practical experiments the pulmotor is arranged to set up a pressure equivalent to 8 inches water gauge and a suction equivalent to 10 inches. There is a small leather accordion bellows which effects the automatic reversal of the apparatus from suction to delivery and vice versa, without ceasing. The operation is extremely simple. The bellows is connected with the air tubes. During inflation the same pressure obtains in the bellows as in the lungs, and as soon as the latter are filled the bellows becomes inflated and, in moving forward, causes the valve to be automatically reversed into position for suction. The operation is now reversed, and as soon as the lungs have been emptied the bellows contracts and automatically reverses the valve again into position for inflating, and so on.

Successful demonstrations of this apparatus have been given to employes of "Pacific Service" at San Jose, Oakland, Sacramento and San Francisco. Three of the appliances have been placed in San Francisco, one at the Fifth Street shops, one at the Potrero plant and one at the garage; two in Oakland, one at the gas works, the other at the Load Dispatcher's office; two in Sacramento, one at the gas works, the other at the electric substation. San Jose, Marin and Redwood Districts have also been supplied.

On December 5th, 6th and 7th, the formal opening of the "Pacific Service" Appliance Store took place at Marysville. It occupies the front part of the storeroom adjoining the company's office and is used entirely for the display of gas and electric appliances. The room is decorated in white and light yellow and is lighted by six 250-watt bowl frosted Mazda lamps with Holophone shades. On one side of the room are displayed gas appliances of all kinds in operation while on the other is a display of electric. One window is used for the display of electric goods and the other for gas appliances.

The opening was announced to our consumers by invitations mailed out several days before and were sent to people in all parts of Sutter and Yuba Counties. During the three days coffee and small cakes was served to all visitors. Much interest was shown in all of the appliances displayed and especial attention was given to the electric range by our out of town consumers. It was announced that the hours would be from two to nine o'clock each day, but after the first day it was found that a great many visitors wanted to come in the morning. The hours were then changed and the store opened at nine in the morning and closed at nine in the evening.

Orders for a large number of appliances were taken during the three days of the formal opening and many of the visitors said that they would be in the market for small electric appliances for Christmas presents. The demonstration was a success in every way and has done much to advertise the company



Company's Appliance Store at Marysville

throughout the Marysville district. Geo. S. Pearson and Mrs. Roach Withers were in charge.

A customer of "Pacific Service" without a complaint for seven years is a worthy testimonial to the success of our efforts to please. Manager John D. Kuster of the San Jose District counts the following as the best valued New Year gift in his remembrance.

"To the Pacific Gas & Electric Company,
Gentlemen:

Having been a customer without a complaint for the past seven years, I esteem it a pleasure to wish for you a prosperous and happy New Year.

Sincerely,
MRS. C. G. ELDER,
Dec. 31, 1912. 558 N. 3rd St."

Manager Kuster forwarded this happy communication to headquarters, and Mrs. Elder in due course received the following letter in acknowledgment:

"Dear Madam:

Your unsolicited testimonial of the service rendered to you by this Company is one of the pleasant occurrences in the life of corporations.

I feel confident that you are not alone in these commendations, although not many have taken the trouble to express them as you have.

With the Compliments of the Season, I am,

Yours very truly,
JOHN A. BRITTON,
Vice-President & Gen. Mgr."

Here is another tribute to the excellence of "Pacific Service," this time from an Oakland admirer.

"Nov. 27, 1912.

Mr. Frank A. Leach, Jr.
Friend Frank:

Let me thank you for having our street put back into good shape after your crew had torn it up. We are used to having public service corporations leave chuck holes that I am most happy to congratulate you for having adopted a different policy for your company.

You may show this letter to the Superintendent of Streets, the Mayor, or anyone if you so desire.

Perhaps I may add that this letter is entirely unsolicited.

Your friend,
SAM P. LOVETT,
1647 4th Ave."

And right here, with pardonable pride, we reproduce a communication regarding our house journal addressed to us from the Washington Power Company of Spokane, Washington:

Spokane, Wash., Nov. 26, 1912.

"Gentlemen:

"I beg to thank you for the copies of your magazine, duly received in answer to my letter of Nov. 7th.

We felt that we wished to bring our file up complete, on account of the usefulness of your magazine and the interesting way in which it shows the development of the electrical business in California. We appreciate your kindness in acceding to our request, and beg to compliment you in publishing such an excellent magazine.

Yours very truly
V. H. GREISSER,
Electrical Engineer."

The members of the Oakland Advertising Association at their weekly meeting, December 3rd, were given a valuable insight into the manufacture and proper use of electric lamps.

Our Mr. J. F. Fugazzi of the Commercial Department, Oakland District, was Chairman of the day and introduced Mr. F. D. Fagan of the General Electric Company, who gave a talk illustrated with stereopticon views upon the progress in manufacture and modern uses of the electric lamp. Another member of "Pacific Service," Mr. G. B. Furniss, also gave a short talk.

A red letter event in the Napa District was the "Get Together" banquet of the employes of the district which took place on the night of November 24th. A festal banquet board was extemporized in the company's store room. A positive credit to the office management was the appearance of the spread before the banquet began. Two rows of incandescent lamps were strung over the long table from end to end and the wires were tastefully concealed with pepper tree boughs. The following menu was served:

Oyster Cocktail
Baked Wild Goose and Quail
Fried Mushrooms
Sweet Potatoes Boiled Onions
Creamed Cauliflower
Hot Biscuits
Baked Apples and Cream
Cake Coffee
Cigars

The entire meal was prepared by the office employes in the company's storeroom—Mr. Oliver Michelson, Accountant, acting as Chef de Cuisine. An interesting circumstance in connection with the affair is that the heaviest part of the cooking was done on a No. 2 Copeman Automatic Electric Cooker. A special meter was put on the cooker so that an exact check could be kept on the amount of current used in cooking the meal. The baked wild goose required $3\frac{1}{2}$ hours, the baked quail $2\frac{1}{2}$ hours, the boiled onions, creamed cauliflower and baked apples $1\frac{1}{2}$. Sufficient was cooked for 22 people with the remarkably low consumption of 2.9 kilowatt-hours or 120 watt-hours per person per meal. Furthermore, the articles cooked were done to an appetizing nicety and retained their natural flavors unusually well. All concerned in the cooking agreed that the Copeman Cooker was a thorough and practical success.

Employes to the number of 21, headed by Mr. O. E. Clark, Manager of Napa District, sat down to the table. At each seat was a place card which hit good naturedly at some pet foible of the person whose name was on the place card, and which served the purpose of breaking the ice and putting all in a jolly, good humor for the evening. After all had done full justice to the good things provided, cigars had been passed around and chairs pushed back, a little "experience meeting" was opened up and ways and means were discussed whereby each employee could most effectively co-operate with other employees for the good of "Pacific Service." Manager Clark explained briefly some of the troubles and difficulties which arose from lack of co-operation on the part of employees of the company and showed how necessary it was for all, no matter in how humble a position, to keep step and avoid clogging the wheels. Practically every employee present took part in the discussion, which wound up with a general and friendly understanding that all would heartily co-operate in the future to put Napa District in the forefront.

Serious matters were then wiped off the slate and the balance of the evening given over to the telling of jolly and funny stories and jokes, and the banquet wound up with everyone agreeing that such a profitable and pleasant event must be repeated in the near future. Those present were: O. E. Clark, Oliver Michelson, E. A. Amstutz, W. H. Brown, Chas. McKenzie, J. B. Harris, Fred Borman, York Stanley, F. H. Hooper, Milton Mayfield, R. Connor, Herman Pfluger, Dan McLean, T. Birdsell, W. L. Maxey, J. D. McCuen, W. L. Coffman, Jess Hermison, Sam Errington, J. J. Mullen and Otto Geiger.

The following communication from the Secretary of the American Gas Institute refers to our report of the convention proceedings at Atlantic City, in which it was stated that the resolution to hold the Gas Congress at San Francisco during the Exposition year was adopted with but one dissenting vote:

"American Gas Institute
29 West 39th Street, New York City.
December 4th, 1912.

"Editor,

Pacific Gas & Electric Magazine,

Dear Sir:

I have just received your November issue and wish to call your attention to an error which has been caused probably from the fact that your information was telegraphed from Atlantic City when the first vote was taken on the matter of the Gas Congress. This vote stood as reported, but at the next session of the Institute the member voting in the negative, (who only voted in that way to appear consistent with his remarks) requested the privilege of changing his vote, which was granted, thus making the vote unanimous.

The only opposition offered was on the supposition that the Institute could have no meeting in that year for the transaction of its own business—this being overcome, all opposition disappeared.

Yours very truly,

George G. Ramsdell,
Secy. American Gas Institute."

Manager Frank Leach of the Oakland District is an enthusiastic supporter of gas for illuminating purposes. With pride and joy he forwards the following:

"The Cape Ann Bakery in Oakland had a fire on the night of December 12th destroying all electric circuits. Mr. Robert Robinson, president of the company, states that he considers himself fortunate in having recently installed gas arcs; otherwise he would have had to suspend business. It will be a number of days before the partitions can be torn out and the wiring replaced, whereas the gas arcs went through the fire without breakage of a globe and not only permitted the cleaning up of the premises early next morning but afforded light for the transaction of the regular routine of their business."

Noting Progress of the World's Fair

The year that is past witnessed great doings in the way of preparing for the great International Exposition that will be held in San Francisco in 1915 to celebrate the completion of the Panama Canal. With two years yet to go before the gates will be thrown open to the public the directors of this great undertaking are more than satisfied with the progress that has been made. In fact, it is officially announced that the Exposition is not only well under way but is even ahead of its schedule, so to speak.

Not only has the Harbor View site been reclaimed and cleared for occupancy, but one structure, the Service Building, is nearing completion. And the New Year was ushered in with joyous ceremonies on the Fair grounds when, before an immense concourse of people, the first spadeful of earth was turned on the site of the Machinery Palace. This will be by far the largest of all the buildings erected on the Fair site. It will cover eight acres and will contain 8,000,000 feet of lumber, enough to floor the Exposition site three times over. The building will be one mile around and will have two miles of ornamental cornices.

The ground-breaking ceremonies were conducted with a stage setting specially provided by Dame Nature. The sky was cloudless, the sun shone brightly and all hearts beat with the joy of the most successful holiday season ever experienced in the history of the city. From President Moore and Mayor Rolph down to the humblest bystander in that throng all felt the spirit of the occasion, and to all the way seemed clear as the sky above. It was a good start made at a good time and it means uninterrupted progress from now on.

An unprecedented record has been established by the fact that twenty-seven foreign countries and thirty-three states and territories of the United States have signified their intention to participate. The twenty-seven foreign countries are: Guatemala, Hayti, Salvador, Santo Domingo, Honduras, Mexico, Panama, Costa Rica, Peru, Bolivia, Japan, Ecuador, Uruguay, Canada, Liberia, France, Nicaragua, Cuba, Great Britain, China, Portugal, Chile, Holland, Germany, Spain, Brazil and Sweden. Of these countries Japan, China, Sweden, Portugal, Canada and Holland have selected their government pavilion site. From assurances given many other countries will signify their acceptance soon, which insures foreign representation on a scale of magnificence and comprehensiveness that promises to beat all records.

The following thirty-three States and Territories of the United States have signified their intention to participate: Arizona, California, Colorado, Georgia, Illinois, Indiana, Idaho, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Washington, Hawaii and the Philippines. Of these the following have already selected their sites: California, New York, Pennsylvania, Nebraska, Arizona, Illinois, Ohio, Utah, Washington, Oregon, New Jersey, Colorado, South Dakota, Nevada, Missouri, Idaho, Kentucky, Montana, West Virginia, Indiana, Hawaii, the Philippines and Minnesota.

Just before Christmas the cheering intelligence was received from Washington that the President of the United States in his message to Congress had urged that the government appropriate $2,000,000 for a special building to house the administration exhibit at the great fair. In his message the President said:

"It is the duty of the United States to make the nations welcome at San Francisco and to facilitate such acquaintance between them and ourselves as will promote the expansion of commerce and familiarize the world with the new trade route through the Panama Canal. The action of the State governments and individuals assures a comprehensive exhibit of the resources of this country and of the progress of the people. This participation by States and individuals should be supplemented by an adequate showing of the varied and unique activities of the National Government. The United States cannot with good grace invite foreign governments to erect buildings and make extensive exhibits while itself refusing to participate. Nor would it be wise to forego the opportunity to join with the other nations in the inspiring interchange of ideas tending to promote intercourse, friendship and commerce. It is the duty of the government to foster and build up commerce through the canal, just as it was the duty of the Government to construct it.

"I earnestly recommend the appropriation at this session of such a sum as will enable the United States to construct a suitable building, install a governmental exhibit and otherwise participate in the Panama-Pacific Exposition in a manner commensurate with the dignity of a nation whose guests are to be the peoples of the world. I recommend also such legislation as will facilitate the entry of material intended for exhibition and protect foreign exhibitors against infringement of patents and the unauthorized copying of patterns and designs. All aliens sent to San Francisco to construct and care for foreign buildings and exhibits should be admitted without restraint or embarrassment."

The State of New York has appropriated $700,000 for its participation while the other States designated have authorized or appointed State Commissions with appropriations ranging from $1,000 to $50,000 to cover their preliminary arrangements.

The Philippine government has made an appropriation of $250,000 gold. Hawaii has also appointed a Commission, which has selected its building site.

Applications for exhibits have come from all parts of the world. It is evident from the demand for space now assured, which amounts to 1,977,000 square feet, and the certain requests from States that have already made appropriations, and the foreign governments that have already accepted President Taft's invitation, that the requests for space will exceed by three times the physical area of the exhibit palaces.

The Department of Concessions has received an almost unprecedented number of applications from all parts of the world, and is proceeding deliberately with its work of selection. Eight of the concessions will mean an expenditure of $1,500,000. One of these is a reproduction of the Grand Canyon on the Santa Fe Railroad, and the contract calls for a concession costing $250,000. Another is a $250,000 reproduction of the Panama Canal, the model alone costing $10,000. A "Forty-Nine Mining Camp," depicting the early days of California, will cost $150,000, while the "Grand Trianon" of Versailles will be reproduced, portraying in art the principal incidents of the Napoleonic period. These will evidence the magnitude of the work undertaken by the Department of Concessions.

The Department of Concessions is proceeding on the theory that it is better to have fewer concessionaries, and to have the concessions instructive, clean and moral.

There will also be a great international regatta, or series of yacht and motor-boat races, that alone will prove an attraction of the first magnitude. These races will cover a period of several weeks, and comprise entries by all the leading yachting and motorboat enthusiasts of the world. Sir Thomas Lipton, during his recent visit to San Francisco, declared his entry and tendered a valuable trophy for the main event, in which there have since been several other entries.

Birdmen from all over the world will take part in an aviation meet; automobile racers of international fame will drive high-powered cars; athletes from the four corners of the world will gather for trials of strength and skill—in fact the premier men in all lines of endeavor will be in San Francisco in 1915.

In the matter of livestock displays, there will be the greatest exhibit ever held along all lines from poultry to blooded horses and cattle.

In June, 1914, nine months before the Exposition opens, all of the main group of exhibit palaces will be completed. One hundred and thirty buildings have now been removed from the site, a million and a half cubic yards of earth have been filled in upon the grounds, and by June, 1914, the exhibits of the world can be rolled into the halls of the exhibit palaces.

W. D. A. Ryan, the famous illuminating engineer who devised the method of illuminating the Panama Canal and handled the illumination problem of the Hudson-Fulton celebration, has been experimenting for several months on the lighting problem and is following a plan which will make the illumination the most striking feature of the Exposition. In describing his plans for lighting Mr. Ryan states:

"One of the special features will be the introduction of jewels in the place of incandescent lights so commonly used at previous expositions. The whole effect will be surmounted by a forty-eight electric scintillator—one for each State, which will be mounted off the main axis of the Exposition, about five or six hundred yards out in the water. It will be placed on barges anchored in the bay, and will require sixty trained men to operate the lights. These will go through an evolution of color, forming Auroras and various effects in the sky and over the Exposition, and will spread like a great lily and be seen in all the surrounding bay cities and, on clear nights, will be visible in the sky for forty or fifty miles.

"We have a great deal of fog here and this will assist us greatly in producing wonderful lighting effects.

"The lighting of this Exposition will, without doubt, surpass anything in lighting in the world's history. One of the strongest features of the lighting will be the fact that effects will be produced here that have never been seen before.

"The entire lighting is new in every respect and it marks an epoch in illumination. The advance since the last big Exposition in science and art of electric engineering and development of electric apparatus has been so great that we are now able to produce effects with economy which would have been physically impossible five or six years ago. In other words, the Exposition is to be a magnificent picture by night with the architectural splendor brought out to the best possible advantage in both form and color, maintaining the daylight perspective."

About the middle of December representatives of the Boards of Supervisors and Exposition Commissions of the various counties of the State visited San Francisco for the purpose of discussing the California building to be erected on the exposition grounds. Forty-seven of the fifty-eight counties were represented and a committee of nine was appointed to prepare a bill and present it to the State Legislature in accordance with resolutions calling for an appropriation by the State Legislature of the sum of $1,000,000 to defray the cost of the construction and maintenance of the State building.

Frederick R. Benson, director of the Shakespeare Memorial Theatre in London and a leader in the development of historical pageants, was in San Francisco during the early part of the year. He was invited to confer with the Exposition officials as to the possibilities of conducting dramatic pageants during the Fair year. Mr. Benson was enthusiastic over the site chosen for the Exposition. "It is unsurpassed for Exposition purposes" he said. "The bay and distant hills will lend beauty and enchantment to the scene." He emphatically supported the idea of a historical pageant for 1915.

PERSONALS

A New Years wedding was that of Mr. George Scarfe, our capable Superintendent of the Nevada Power and Water Districts, who was joined in the bonds of matrimony to Mrs. Clara Ostermann. The wedding took place in San Francisco, though the bride and groom will return to their mountain home at the end of their honeymoon.

Mrs. Scarfe is a well-known resident of Nevada City. She possesses considerable artistic talent and has executed a number of beautiful paintings which have been greatly admired.

Also from Nevada District comes intelligence of the wedding of Mr. Chas. Pierce, an employe of the Grass Valley office of the Company, and Miss Frances Fitzgerald, sister of the Nevada County Superintendent of Schools.

Of this happy couple Mr. John Werry, Manager of the Nevada District, writes:

"Charles Pierce, although a young member of the 'Pacific Service' family, is a worthy employe. He has proved to be a workman, faithful, reliable and of sterling qualities. His bride, who is a native of Grass Valley, is one of our brightest productions. I have known her from childhood and I think her husband is indeed fortunate in his choice. I predict a happy journey through life for Mr. and Mrs. Pierce."

Mr. R. G. Shaw, operator at the Woodland station, recently espoused Miss Elsie W. Thomas, of Newton, Ill. The wedding took place at Sacramento, after Mr. Shaw had waited for his bride-elect from 10 o'clock in the morning until 7 in the evening, a belated Overland being responsible for the delay.

The wedding was the culmination of a romance that started three years ago in St. Louis when Mrs. Shaw was in attendance at the Waltener Conservatory of Music. She is attractive and accomplished, being a finished pianist. Her husband is recognized as one of the most capable young electricians in the employ of "Pacific Service."

Mr. Walter Pregel Coffin, an employe of the Electrical Distribution Department of the San Francisco District, is another addition to the company of benedicks. His bride was Miss Christena Davidson Lindsay. The wedding took place December 4th at Trinity Presbyterian Church in San Francisco.

Mr. James W. Jeffers, one of the company's metermen in Vallejo District, will be married some time this spring to Miss Hazel Greenwood, formerly of Vallejo but now of San Francisco. The engagement of the young people was announced at a dinner party at the St. Francis Hotel in San Francisco during New Year week. The happy groom-to-be is planning to build a cozy home for his bride at Vallejo.

Dan Cupid is certainly a busy young man these days. He seems to have turned his bow upon "Pacific Service" with a vengeance, and his arrows are striking home right and left.

Mr. F. C. Ensinger, Superintendent Electric Meter Department, San Francisco district, is confined in the German Hospital with a broken leg. He received his injury in a fall December 20th, while attempting to leave his buggy after the front axle had broken, causing his horse to run away.

Pacific Service Magazine

PUBLISHED IN THE INTERESTS OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON - - - - EDITOR-IN-CHIEF
FREDERICK S. MYRTLE - - - MANAGING EDITOR
A. F. HOCKENBEAMER - - BUSINESS MANAGER

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

VOL. IV JANUARY, 1913 No. 8

EDITORIAL

ANOTHER YEAR IS BORN, AND AS "JANUARY GREY" is ushered in the timely feeling of hope and confidence in the future is unusually prevalent.

There appears to be a consensus of public sentiment throughout the State of California in favor of deciding that this has been the most successful Yuletide season ever experienced. Of course, to this happy conclusion it may be objected that man is ever prone to look upon the latest as the best, that it is an old story and will be heard anew a twelvemonth from today. Well, now, let us look at conditions, absolutely the sole basis of sane judgment in matters of this kind, and see whether they justify the conclusion referred to.

We think it will be admitted that prosperity is universal within the confines of our glorious State. That infallible barometer of interior conditions, the farmer, is happy. He has enjoyed a succession of excellent harvests without a setback. All over the State one hears of the ever-increasing yield per acre of the soil from which spring our luscious fruits and our golden grain. Man's invention has solved the once dread problems of reclamation and irrigation, and today the agriculturist fears neither flood nor drought. The great world outside California has awakened to her products, and we are no longer looked upon as a wild and woolly community, living in half-savage state "somewhere the other side of the Rockies." So that from now on it seems reasonable to assume that the demand will keep up with the supply, and that spells prosperity for us.

Developments are in progress everywhere. Mining is in full blast, factories are springing up all over the interior, new enterprises are recorded daily. In the big cities the same story is told. Bank clearings show the volume of business done. Merchants, wholesale, are reaping the benefit of prosperous conditions in the interior, and if you want to know how matters are with the retail merchant, ask him how he fared during the Christmas season just past. Taking San Francisco as the best criterion, reports from her great stores show that all previous records were smashed to smithereens by the tide of humanity that flooded the business section of the city during the closing month of the year that is gone.

There is a general looking forward to the year 1915—not so very far away—when the gates of the first International Exposition ever held on the shores of the Pacific will be flung open to the nations of the world. No need, surely, to tell here what this will mean to California. It will bring legions of visitors from every civilized country on the face of the globe, and of these a goodly proportion may be counted upon to seize the hand held out in golden promise and take up permanent residence where Nature invites development of her almost limitless resources. Those who are in charge of this gigantic undertaking report more than satisfactory progress, and there is almost absolute certainty that not only San Francisco, the chosen stage-setting of this international spectacle, not only the great State of California, but the entire West, united in its comprehensive grasp of opportunity, will, on the 20th day of February, 1915, enter upon an era of unexampled advancement and development to which the conception of man can set no limit of time or scope.

So with the revival of the sun's energy that, according to the custom of the ancients, is heralded by the New Year in all climes north of the Equator, renewed hopes and anticipations are nurtured in the breasts of all of us whose great privilege it is to be of California. Happy New Year! It starts out full of promise; may the pledges it so freely gives be more than redeemed ere the next milestone on the highway of life is reached!

Public Utilities in California are profiting by the general prosperous conditions, as well they may, seeing that they have so materially assisted in their establishment. The report of the State Railroad Commission shows that during the past nine months the exceptionally large sum of $54,721,925.41 has been invested in the development of public utilities coming under the jurisdiction of the Commission. Of this total $46,282,763 represents the authorized issuance of bonds, debentures or notes, while the balance of $8,439,162.41 represents stock issued. This is at the rate of $72,000,000 per annum. The report states that while no exact figures are available it is probable that 1912 was the banner year in financial development among public utilities in California, and applications now pending before the Commission may increase the figures given by some $10,000,000.

A brave showing, truly! The record for 1912 shows that more money was raised for purposes of electric railroad construction than for any other form of public service enterprise, and that next in importance were the gas and electric corporations. The following figures are given:

Power Corporations—Bonds, etc., $7,246,763; stocks, $241,700; total $7,488,463. Gas and Electric Companies—Bonds, etc., $6,256,000. Gas Companies—Bonds, etc., $454,000; stocks, $255,775; total, $700,775.

In a previous issue of Pacific Service Magazine we published excerpts from the financial press of London, commenting upon the growing favor with which the investing public is regarding public utility securities, and, giving reasons therefor. It is evident that the public utility of today is accepted generally as an institution of stability, a better investing medium than railroads and other commercial enterprises to which the guardians of trust funds were wont to confine their attention. And in this new condition of things our own "Pacific Service" plays a most important part.

The story of the Pacific Gas and Electric Company's own wondrous development, of its aid in the development of the vast territory covered by its system, of its sound, progressive policy, is no longer a new one. Apart from the records published from time to time in this, our house journal, the interior press has fairly teemed with matter descriptive of our various branches of enterprise and is most eulogistic thereof. But the following information supplied by the Controller's department is of special interest just now as bearing out the observations of the world's financial experts regarding the standing of public utilities such as ours in the investment market:

On December 31st, 1910, we had 1,380 stockholders; on October 31st, 1912, the number had increased to 2,400. The number of stockholders in "Pacific Service" almost doubled in less than two years.

Among our present stockholders are 759 women, who hold in their names stock of the par value of $4,213,000.

Of the total issues aggregating in the neighborhood of $42,000,000, 90 per cent is held in the United States.

Taking stocks and bonds together there are probably 25,000 individual holders of "Pacific Service" securities, including many beneficial institutions such as orphanages, hospitals and others of a similar character depending either wholly or in part for their support upon the income derived from investment of endowment funds.

The spirit of the times is thus revealed.

DOINGS OF OUR COMPANY SECTION
N. E. L. A.

OFFICERS AND STANDING COMMITTEES 1912-1913

OFFICERS

Chairman: A. R. Thompson, San Francisco, Cal.
Vice-Chairman: J. D. Kuster, San Jose, Cal.
Secy.-Treas.: Henry Bostwick, San Francisco, Cal.

EXECUTIVE COMMITTEE

S. V. Walton, San Francisco, Cal.
C. J. Wilson, San Francisco, Cal.
F. H. Varney, San Francisco, Cal.
Geo. H. Bragg, San Francisco, Cal.
R. C. Powell, Oakland, Cal.

STANDING COMMITTEES

Papers and Meetings:
S. V. Walton, Chairman, San Francisco, Cal.

Membership:
F. H. Varney, Chairman, San Francisco, Cal.

Question Box:
C. J. Wilson, Chairman, San Francisco, Cal.

Editorial:
H. Bostwick, Chairman, San Francisco, Cal.

The regular monthly meeting of the Pacific Gas and Electric Company Section of the National Electric Light Association was called to order at 8 o'clock P. M., December 18th, 1912, Chairman Thompson in the chair. Upon roll call the following members answered present:

Bostwick, Henry; Bragg, G. H.; Britton, J. A.; Brown, Earl D.; Cropper, Francis Malcolm; Dodge, E. E.; Driscoll, W. J.; Fisher, R. E.; Jones, W. T.; Lisberger, S. J.; Myrtle, Frederick S.; Robinson, R. W.; Sultan, Walter D.; Taylor, Geo. P.; Vincent, W. G. Jr.; Weymouth, E. A.; Wilson, C. J.; Armstrong, T. H.; Baylor, N. R.; Baker, Chas. P.; Bucher, Paul; Chapman, P. E.; Coleman, W. S.; Condon, W. S.; Conlisk, R. F.; Copeland, Thos.; De Long, Geo. B.; Ohnemuller, C. B.; Powell, R. C.; Price, W. L.; Ready, L. S.; Scherer, W. W.; Sellmer, C. J.; Knopf, Herbert; Watson, J. H.; Kuster, J. D.; Ensinger, F. C.; Freygang, P. J.; Fitzgibbon, M. H.; Gray, F. S.; Green, Bert D.; Greene, Oliver D.; Hartfield, H. B.; Holberton, G. C.; Hardenbergh, P. B.; Hyde, Walter S.; Hixon, D. E.; Lutzi, R. P.; Moore, Spencer; McFarland, A.; Merrick, A. P.; Piatt, F. C.; Phillips, A. A.; Rogers, Edwin A.; Redd, Chas. A.; Schoolcraft, Jas. E.; Siefkes, L. L.; Suydam, Chas. H.; Szezpanski, E. M.; Theis, A. J.; Thompson, A. R.; Talcott, D. W.; Talcott, Frank; Shaw, S. B.; Page, M. L.; Golcher, Chas. L.; Howland, J. W.; Reuss, Christian; Hansen, J. O.; Cadan, Clarence L.; Clements, John; Donaldson, Walter A.; Unger, Cress; Varney, F. H.; Varney, J. W.; Van Loben Sels, E. D.; Van Zandt, W.; Wilson, James L.; Southerland, F. J.; Ray, Don C.; Crotty, Ralph Phillip; Dallerup, Chas.; Duncan, R. C.; De Vaughn, R. C.; Ekenroth, H. L.; Hoffman, G. H.; Smith, Jos. A.; Walsh, W. J.; Adams, Ralph, O.; Brandt, A. U.; Chrysostomo, Jos. Jr.; Crowell, R.; Eliason, Andrew; Furniss, Geo. B.; Jordan, J. Chas.; Jones, Wm. H.; Keesling, H. G.; Mann, E. P.; Marston, F. C.; Felts, I. T.; Gray, C. W.; Heino, W. L.; Maas, W.

E.; Reurg, A. A.; Zech, John A.; McCarthy, W.; Lambourne, Arthur F.; Seaver, F. D.

The minutes of the previous meeting of November 20th, as well as those of the Executive Committee meetings held on November 25th, November 29th, December 4th, December 12th and December 18th, were upon motion duly made and seconded, approved as read. The Secretary announced the fact that the applications for membership to hand brought the membership of the Company Section up to 401, being 101 in excess of the number for which the Company was to be called upon to remit the first year's dues, in accordance with resolution duly adopted by the Executive Committee at their meeting held on November 29th to the effect that when the membership of the Company Section reached 300, the Company would not thereafter be expected to remit the first year's dues. In view of the above fact, Mr. Frank H. Varney, as Chairman of the Membership Committee, presented the following resolution before the meeting, and which resolution was duly seconded by Mr. Kuster.

"Resolved, That the Company be requested to assume the first year's dues of the 101 applications for membership in excess of 300 members, all of which applications having been duly approved for such membership by the Executive Committee."

Chairman Thompson called upon the Chairman of the Membership Committee, Question Box Committee, and Editorial Committee for a few remarks concerning the work to be undertaken by their respective committees. Mr. Walton, Chairman of the Committee on Papers and Meetings, owing to his absence from the city was not present.

Mr. Britton, General Manager of the Company, being in attendance upon the meeting, was called upon for a few remarks. Mr. Britton pointed out the great work which has been accomplished by the Company Sections, insofar as making the employees so asociated much better qualified to handle the everyday problems met with in the Central Station industry, and expressed great satisfaction at the interest which had already been manifested in the Company Section by the employees, the membership having increased from 81 to 401 in the short space of two months, without any activity on the part of the membership committee. Mr. Britton said he was very much gratified to see that the employees of the Company realized the great advantages to be gained by their being so associated. For the benefit of the members of the Company Section, Mr. Britton stated that at least five delegates representing the Company would be sent to attend the annual convention of the National Electric Light Association in Chicago next June, and that such delegates would be selected from the employees who were members of the Company Section and who manifested the greatest interest in the affairs of the Company Section.

For the benefit of the members in attendance upon this meeting, Mr. J. P. Coghlan, Claims Agent of the Company, arranged with the representative of the "Pulmotor" to give a working demonstration of this wonderful contrivance, and in all of which the members present showed great interest.

There being no further business to come before the meeting, on motion duly made and seconded, same adjourned.

Henry Bostwick,
Secretary.

Greetings From the Chairman

Pacific Gas and Electric Company and Members of Pacific Gas and Electric Company Section:

The Pacific Gas and Electric Company Section of the National Electric Light Association extends to you greetings of this the dawn of a new era in our Company's activities.

On Wednesday, November 20th, 1912, in meeting assembled, a Company Section of the National Electric Light Association, to be known as the Pacific Gas and Electric Company Section, was organized, officers duly elected and installed. The proceedings on this occasion while modest and unpretentious in their simplicity, were nevertheless most impressive and significant, in so far that this occasion marks the laying of the corner-stone upon which is destined to rise a structure of education and general uplift for that great body of employees of the Pacific Gas and Electric Company's System, and a lasting and fitting monument to "PACIFIC SERVICE."

This event marking the unfurling of the banner of the Pacific Gas and Electric Company Section is but the silent "call to arms" to all employees to rally to its support and bear it on to victory and success.

Heretofore the Company Sections of the National Electric Light Association have been located entirely in the East—"Stars of the East"—and veritable stars they are, but now with the birth of the Pacific Gas and Electric Company Section a "Star of the West" is risen in the National Electric Light Association's firmament, and destined to lend its luster and brilliancy to the galaxy of stars forming the present N. E. L. A. constellation. But in order that our section shall be an honor and credit to ourselves, to our Company, and to the Association at large, it is incumbent upon each and everyone of us to help and assist in this great work which now lies before us, and which has but just begun.

While we must all realize that we have a great work to do, we are signally fortunate in the fact that we have at the same time a great organization with which to do it. Our Eastern brothers in the activities of their respective sections have been most remarkably successful and have accomplished an immeasurable amount of good, both to themselves and to their companies.

When we stop to reflect upon the vastness of that organization, The National Electric Light Association, made up of over 15,000 members, which membership includes approximately 1,250 electric light and power companies and manufacturers of electrical machinery in the United States, including a membership of over 11,000 employees of these companies, together with local sections in all the big Companies of the East and Middle West, we cannot but appreciate what a wonderful organization this great movement represents.

This great school of educational advantages furnishes an inexhaustible supply of technical knowledge, together with an unlimited amount of data, facts, and figures, as regards accounting and finance, in addition to limitless other information regarding practices and organization incident to the electric light and power industry. This information is invaluable to both employer and employee and is available at all times, and all members are privileged and requested to draw upon the same without limitation or restriction.

This organization is an organization with but one object in view, and that to protect and foster the interests of the electric light and power industry. It protects and fosters the interests of the employee as well as employer; in other words it is a co-operative organization, and organized for the protecting and fostering and promoting the welfare of both the employee and the Company.

On the eve of organizing this, our Company Section, our membership was 81, and at the close of our regular monthly meeting on Wednesday, December 18th, 1912, our membership had reached 401, showing that the employees that are behind "PACIFIC SERVICE" are alert and ready at all times to absorb additional knowledge, thereby better fitting themselves to be of greater service to the organization.

We therefore, with this solicitation on behalf of the present membership, request your co-operation and extend a most hearty welcome to such of our employees who have not as yet become associated with the Company Section to do so at this time.

Yours very truly,

A. R. THOMPSON,
Chairman, Pacific Gas & Electric Company Section.

Notes — by the Editorial Committee

Watch our membership reach the 500 mark and then some.

Be a competitor for the prize of being a representative of the Company Section at the next convention of the N. E. L. A., Chicago, June 1913.

Our Question Box Editor has not as yet had an opportunity to cut out his work in order to bring about the desired results. However, he promised something interesting in our next issue of the magazine, and being of a conservative frame of mind is adhering to the old adage, "Be sure you are right, then go ahead."

COMMERCIAL DEPARTMENT

The employees of the Commercial Department of the Pacific Gas & Electric Company are a unit in their desire and pleasant anticipation of being associated with the N. E. L. A. Owing to the peculiar problems, often times presented in commercial work, for which there is no precedent to follow, it is absolutely essential that we have some method for exchange of ideas. We feel certain that the N. E. L. A. offers the very best opportunity for this, as well as the opportunity of acquaintance with other employees of the company which is absolutely essential to efficiency and harmony.

OAKLAND DISTRICT

Our company pioneered and has developed the greatest Hydro-Electric System in the world. This greatness is the work of its employees, fostered by big men of large faith and indulgent capital.

As in the past so in the future will its success necessarily rest upon this great army of employees. What makes for the broadening and strengthening of the employee and prepares him for larger and increased responsibilities, makes for better service. Fellowship makes for unity; education makes for greater usefulness.

Let us have a good strong N. E. L. A. Section. The Oakland bunch is hungry to go to work. We need its fellowship and the wisdom of its council.

OPERATION AND MAINTENANCE DEPARTMENT (HYDRAULIC)

The Operation and Maintenance Department (Hydro) feels that this Company Section will be the means of creating a more friendly feeling between the employees of the company by the monthly meeting in which we can all get acquainted and by the discussion of papers educate each department with the workings of the other, thus creating a better understanding between them with the consequent reduction of chance for friction.

OPERATION AND MAINTENANCE DEPARTMENT (STEAM)

We can assure you that the formation of a Company Section is greatly to be desired. The consensus of opinion is that while the various engineering societies, such as the Electrical, Mechanical and Civil, do excellent work in their respective fields, we all feel the want of a society which shall be a well of practical information into which and from which the men who are doing things can pour the result of their experiences, or draw forth equally valuable knowledge to be applied directly to the problems of the hour.

This long-felt want is now being filled by the National Electric Light Association, and it is fitting that a company of the magnitude of the Pacific Gas and Electric Company should color the National Association—the extent of which depending on ourselves—by the formation of a Company Section.

SACRAMENTO DISTRICT

When first notified of the fact of the Pacific Gas and Electric Company forming a Company Section of the N. E. L. A., the thought that immediately presented itself to our minds was "If Mahomet does not go to the mountain, then the mountain must come to Mahomet." By this comparison we mean that the mountain represents the vast amount and value of the knowledge that is accumulated and disseminated by the N. E. L. A.

It should certainly be considered a "Red Letter" day for our section when it was admitted to membership in the N. E. L. A.

Allow us also to say "and this confidentially" to the members of our Section, that the N. E. L. A. should sit up and take a little notice of what has just arrived in its midst, for in the language of the day the Pacific Gas and Electric Company Section is "certainly some section" and without doubt will be an organization of which the entire Pacific Gas and Electric Company can be justly proud.

ELECTRIC DISTRIBUTION (SAN FRANCISCO DISTRICT)

Each and every member of the Electric Distribution Department stands ready to show their appreciation by their attendance at the meetings; and the individual interest that will be shown in the papers and discussions affecting their department will be a living expression of how they feel toward belonging to this great organization.

Steam Department Changes

Engineer Frank H. Varney of the O. & M. Department, Steam Section, has appointed Mr. T. E. Fogalsang, former Superintendent at Station "A" in San Francisco, his Assistant Engineer. Mr. Fogalsang is now established at headquarters. Mr. C. A. Eastwood, former Chief Engineer at Station "A" has been placed in control of the Electric Department at Station "A" in addition to the Steam Department and bears the title of Superintendent of Station "A".

Mr. J. W. Varney has been placed in charge of Stations "E" and "H" in addition to the other San Francisco sub-stations of which he is Superintendent.

Our Front Cover Designs

Our readers have by this time noticed and, we trust, appreciated the change in the cover design of our magazine. It is our purpose to display each month some one of the many scenic features of the vast system operated by "Pacific Service." The cover design for last month's issue was a picture of the Butte Creek Ditch. This month we present a view of the main South Yuba Canal Head Dam.

Every member of "Pacific Service" is hereby notified that if any especially artistic view at or near the scene of his labors appeals to him as worthy of display on our front cover, he is invited to bring the same to our notice.

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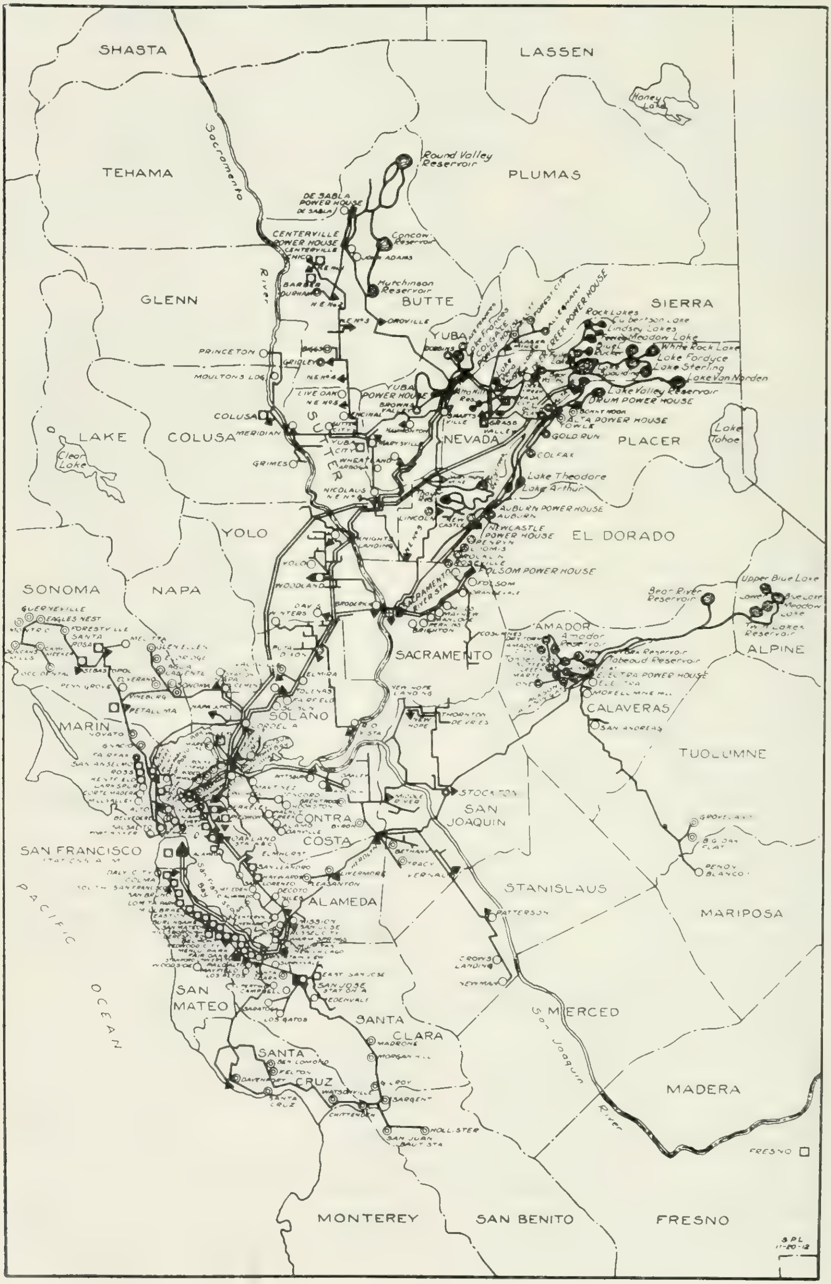
SHASTA
LASSEN
Honey Lake
Sacramento River
Round Valley Reservoir
TEHAMA
PLUMAS
DE SABLA POWER HOUSE
CENTERVILLE POWER HOUSE
CHICO
Concow Reservoir
Hutchinson Reservoir
GLENN
BUTTE
OROVILLE
SIERRA
Rock Lakes
Culbertson Lake
Lindsey Lakes
Meadow Lake
White Rock Lake
Lake Fordyce
Lake Sterling
Lake Van Norden
Lake Valley Reservoir
DRUM POWER HOUSE
ALTA POWER HOUSE
YUBA
COLGATE POWER HOUSE
YUBA POWER HOUSE
PRINCETON
GRIDLEY
MOULTONS LDG
LIVE OAK
COLUSA
MERIDIAN
SUTTER
YUBA CITY
MARYSVILLE
WHEATLAND
GRIMES
NICOLAUS
NEVADA
GOLD RUN
COLFAX
PLACER
Lake Tahoe
LAKE
Clear Lake
COLUSA
Lake Theodore
Lake Arthur
AUBURN POWER HOUSE
AUBURN
NEWCASTLE POWER HOUSE
LINCOLN
YOLO
KNIGHTS LANDING
EL DORADO
FOLSOM POWER HOUSE
FOLSOM
WOODLAND
SONOMA
NAPA
Bear River Reservoir
Upper Blue Lake
Lower Blue Lake
Meadow Lake
Twin Lakes Reservoir
ALPINE
GUERNEVILLE
EAGLES NEST
FORESTVILLE
SANTA ROSA
SEBASTOPOL
PETALUMA
SACRAMENTO
AMADOR
Amador Reservoir
Tabeaud Reservoir
ELECTRA POWER HOUSE
CALAVERAS
SAN ANDREAS
SOLANO
MARIN
NOVATO
TUOLUMNE
STOCKTON
SAN JOAQUIN
CONTRA COSTA
SAN FRANCISCO
OAKLAND
LIVERMORE
PLEASANTON
TRACY
BIG OAK FLAT
PENON BLANCO
STANISLAUS
PATTERSON
ALAMEDA
MARIPOSA
PACIFIC OCEAN
SAN JOSE
SAN MATEO
SANTA CLARA
LOS GATOS
MERCED
San Joaquin River
SANTA CRUZ
WATSONVILLE
GILROY
SARGENT
HOLLISTER
SAN JUAN
MADERA
FRESNO
MONTEREY
SAN BENITO
FRESNO
S.P.L. 11-20-13

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,800 people.
OPERATES 11 hydro-electric plants in the mountains.
5 steam-driven electric plants in big cities.
16 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,775 square miles.
⅗ the size of New York State.
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HARDY knows why.

Because he has a large organization behind him and a world of data.

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C. E. HARDY
165 Second St.
San Francisco, Cal.

VOL. 4 FEBRUARY 1913 Nº 9

Pacific Service Magazine

PUBLISHED MONTHLY BY THE
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

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Pacific Service Magazine

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Yearly Subscription $1.50

Single Copies each 15 cents

(See Story.)

LAYING THE CORNER-STONE OF LAKE SPAULDING DAM, OCTOBER 28TH, 1912.

PACIFIC SERVICE MAGAZINE

VOL. IV FEBRUARY 1913 No. 9

Lake Spaulding Dam—Progress To Date

Foundation Made Secure Against Winter Storm and Spring Flood

By H. C. VENSANO, Civil Engineer.

H C Vensano

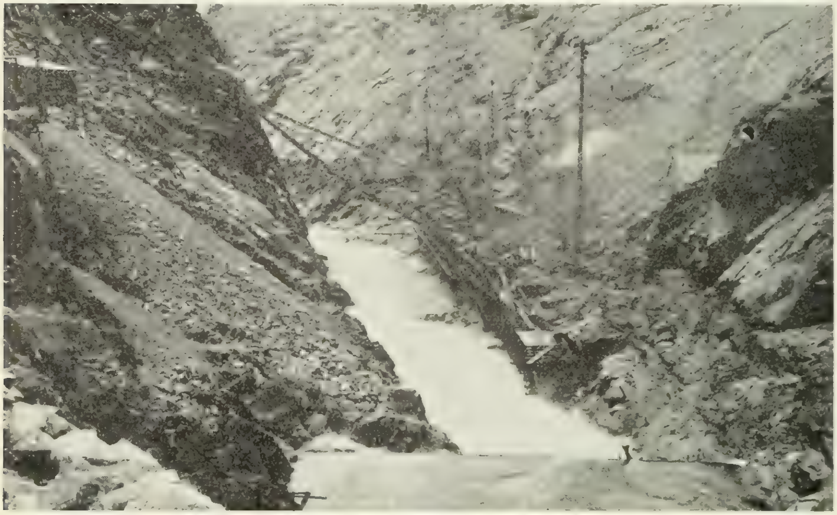
The first season of construction of the new Spaulding Dam, with which work our readers are all by this time more or less familiar, has closed. While the work is at present practically shut down for the winter, the past season witnessed the completion of all that was contemplated for that season, and more.

The plan laid out for the first season's work required that its close should find all preliminary work finished and everything in organized shape, so that the construction could be picked up in the Spring with the first passing of the winter storms and carried forward at maximum speed. This preliminary work embraced a complete plant-installation, the construction of several miles of railroad, the opening of sand-pit and quarries and, above all, the cleaning of bed rock and enough work on the actual dam to carry it to such sufficient height that ample spillway would be provided through the concrete itself to handle the Spring floods. To do this meant the pouring in of about 5,000 yards of concrete to bring the dam to a height of about 25 feet above bed rock. And all this was necessary for the following reasons:

As in all other streams of this portion of the country, the fall flow is the lowest, and the Spring floods coming from the melting snows give the largest flow of any time of the year. The dam site is situated in a narrow gorge only about 30 feet wide at the bottom. The ultimate outlet tunnel of the reservoir will be located 70 feet above the base of the dam. It can therefore be readily seen that during the early stages of construction there would be little room for by-passing the water of the river, which would all have to be handled in some form of flume raised above the river-bed until such time as the dam could be brought up to sufficient height to afford a wide enough crest to leave room for construction operations as well as spillway width.

Records of the flow of the South Yuba River kept by this company for the last seven years tend to show a low flow of but a few second feet and a maximum flow of not more than a few hundred second feet up to December 1st of any year, while Spring floods of as much as 3,000 second feet or more are not uncommon.

Due to the narrowness of the gorge it was considered practically impossible to divert the Spring floods from the river-bed and still leave room to work therein, but by raising the dam to a height of 25 feet a crest width of 100 feet could be obtained. This would be sufficient to provide spillway room through the permanent concrete structure for all stages of the river and still leave considerable portions of the concrete mass free of water to be carried on up.



Diverting dam and flume during the flood.

As it was not decided to undertake this project until late in the Spring, it was not possible to take advantage of the low flow of the stream, but it was thought that 600 second feet could be easily and safely handled. It therefore seemed imperative to raise the dam to this height of 25 feet during the late fall, say before the first of December, thus providing spillway for the Spring floods and enabling work to be recommenced in the early Spring with the first melting of the snows.

If, on the other hand, it should be found impossible to divert the water before the winter season set in, it could in all probability not again be undertaken until well towards the summer of the succeeding year at such time as the stream should again fall, probably about the first of July. This meant lengthening by several months the winter period of inaction, and a delay in the ultimate completion of the installation for perhaps a full additional year with its attendant loss of revenue of many thousands of dollars.

This work as outlined has all been accomplished and the dam now stands, not 25 feet, but 38 feet above bed rock, with two spillway sections, each having a capacity for the entire Spring flow. These are to be used alternately in the Spring in bringing the dam up to the height of the permanent outlet tunnel.

But with how much effort this has been attained, and by what narrow margin, is best realized by those connected with the work. I often wonder if the casual observer in noting the progress of any great piece of construction in any way appreciates with just how much effort, worry and mental strain to those concerned such progress has been accomplished, or how many unforeseeable impediments and hindrances attend it. Perhaps the reader would be interested in an outline of one or two such instances of unforeseeable occurrences.

Imagine yourself momentarily in the position of Chief Engineer Baum or Division Superintendent Duncanson, with their large responsibilities. It is now November 5th, the season is nearing its close. Snows are imminent and, with them, the closing down of the work. The bed-rock is not yet cleaned. This is yet to be done, and 5,000 yards of concrete placed in the dam. Remember you are in charge, it is up to you. Will the weather hold off a few days more?

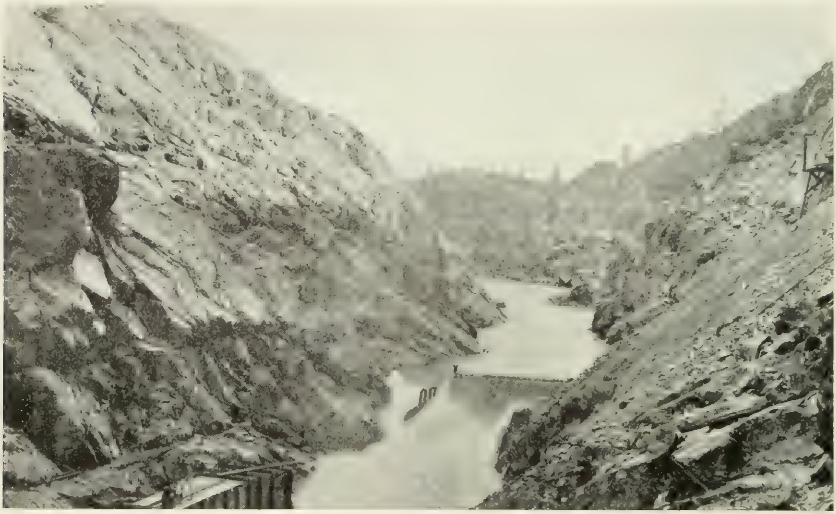
Following the previously outlined plan, a wooden diverting dam and flume have been constructed to carry about 600 second feet across the dam site so as to leave the river bottom dry and afford the necessary conditions for work on the dam foundations. The uncovering of bedrock has been commenced. You go to bed satisfied and hopeful. During the night it rains torrents, and when morning dawns more than 3 inches has fallen over many square miles of catchment area tributary to Spaulding. The bare rocky slopes which are characteristic of this region offer little obstruction to the run-off, with the result that old Lake Spaulding, which has been drawn down several feet to act as a regulator, begins to fill.

You order the discharge gate opened wide. The run-off from the precipitous valley sides is such, however, that, in spite of this, by noon November 6th the old lake has attained its full height. You can do nothing. The water begins to run over the spillway, and in a very few minutes 2,000 second feet or more is spilling over and flowing down the South Yuba. This flood is more than three times as great as any recorded in any previous fall. The wooden flume constructed with so much care leading from the diverting dam is destroyed and carried away before your very eyes, and the waters again flow across the site of the new Spaulding Dam.

What are your feelings? Will you be discouraged and postpone the work, or will you jump in with a new vigor in an effort to continue and complete what has already been done and proposed for the season?

This flood actually occurred on the date mentioned, and the accompanying illustrations give one an idea of the conditions. Fortunately the diverting dam held, but when within a few days the water had subsided the work on the entire flume had to be recommenced. This required several days, and after raising the diverting dam and turning out the river again the time had moved around to November 11th, with snows which might prevent

Clearing the bedrock on the dam site.



Looking upstream, showing destruction of flume by flood.

further work to be expected at any time, and with the bedrock still to be cleaned and the 5,000 yards of concrete still to be placed. Under the conditions it was not possible to reconstruct the flume as well as desirable, with the result that there was some leakage from it as well as from the diverting dam, and also an accumulation of water in the loose rocks in the dam site to be handled.

A 6-inch centrifugal pump was immediately installed and started, but such was the leakage that it was found the pump could only gain on the water by a narrow margin. Additional pumps had been ordered but had been delayed in transit, and as they had not arrived the one pump was speeded up beyond its ordinary speed until the water began to fall. After twelve hours' continuous pumping the water level had lowered several feet, and it was estimated that by the following morning the bedrock would be sufficiently dry to admit of cleaning it and placing the concrete.

How everyone watched the weather for signs of storm and prayed for a good day on the morrow! With a plant capacity of 1,500 cubic yards of concrete per day, one or two good days would mean the permanent diversion of the river and the saving of thousands of dollars in the Spring!

The night appeared fine and everyone was optimistic. But just at midnight word was brought to headquarters that the pump was giving trouble, and, a little later, that it had run hot and "frozen" a bearing. The water of course immediately started to rise in the foundations. A hydraulic ejector was at once rigged, using a small amount of water available from a higher level. Its capacity was insufficient, however, and the water continued to rise. Every effort was made to repair the motor and return it to its place in the pit. When the next morning dawned, Chief Engineer Baum and Superintendent Duncanson might have been seen working feverishly with the men in an effort to repair the motor and get the pump back into its place in the foundation pit. The extra and larger pumps had not yet arrived and, meanwhile, the water had regained its full height, and another day had been lost.

I wonder if anyone not connected with the work can appreciate the feeling of these men responsible for the carrying out of this great project. That sunshiny day seemed almost a hardship. "Such good weather for concreting," could be heard on all sides; "Such a good day"; "How long can the first big snow of the year hold off?" and "Will the necessary work be completed by that time?" When only one or two more days are necessary, how great does the danger of approaching snows seem and, in this case, how really imminent were they on November 15th, with no snow on the ground at a height of 4,600 feet!

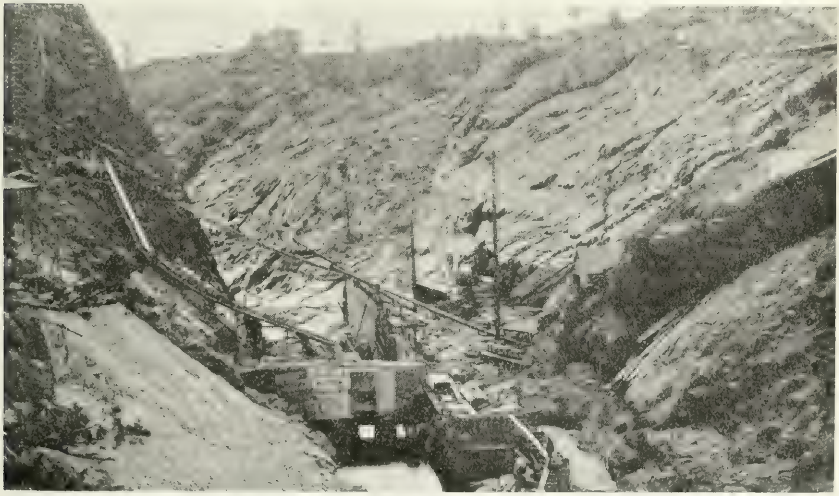
On November 15th the first concrete was poured and the dam was brought to its present height on November 24th. No snow at this elevation in late November is a rather unusual condition in the Sierra Nevadas. As a matter of fact 2½ feet fell on December 14th and 15th, only twenty days later. How easy to look back and say twenty days, a comfortable margin, but how hard to look ahead, not knowing the margin, and wonder whether there will be but a few days or few hours of good weather ahead!

The last of the bed rock was cleared and concrete placed on December 21st. The concrete when poured was kept from freezing by the use of steam pipes over the completed mass and by the use of warm water for mixing.

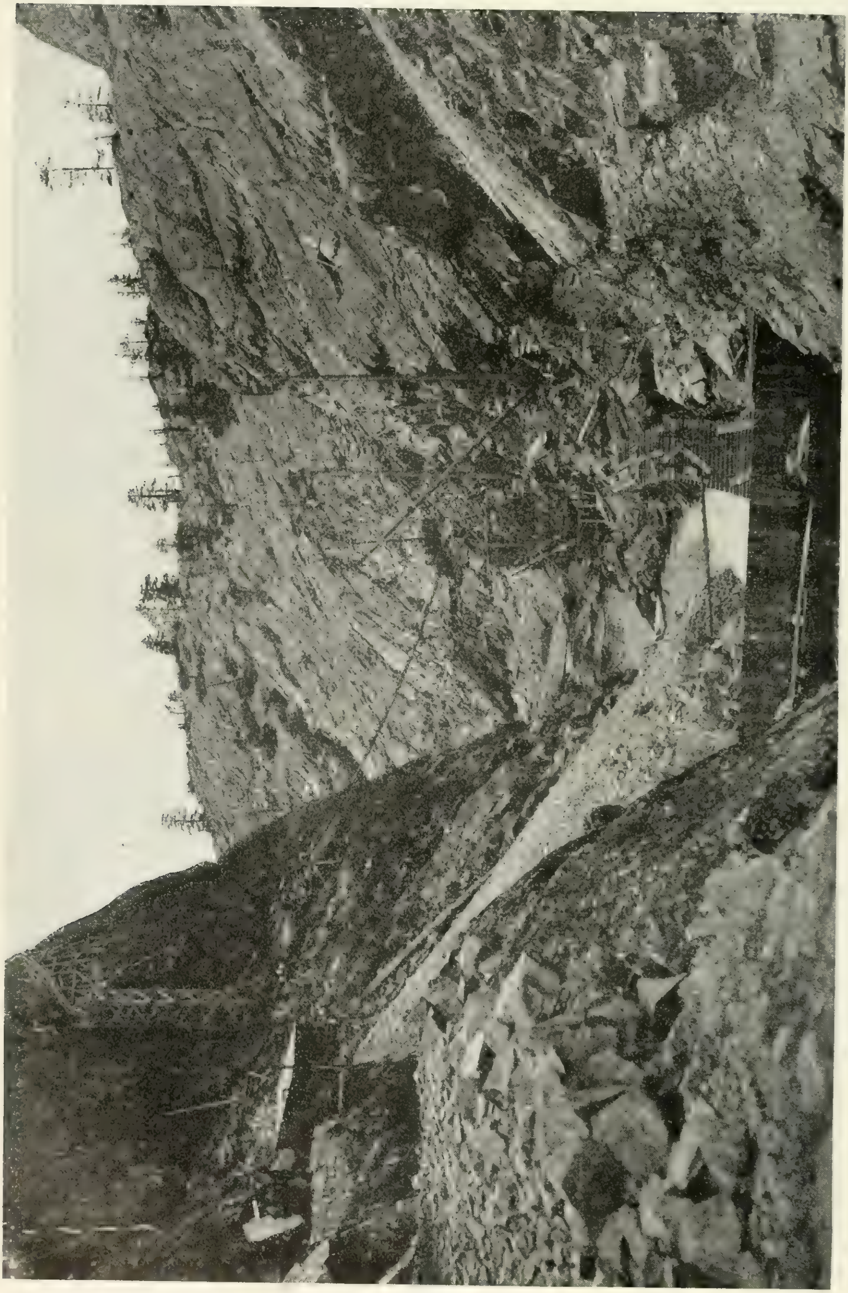
Can you see the men working in the wet river bottom with the temperature at 25 degrees and small icicles forming wherever water leaked or splashed?

The result of it all is that today the dam stands 38 feet high, with the river flowing over the spillway on one side of it to a point well beyond, and no matter what floods may occur in the early Spring Spaulding Dam will continue to rise without interruption.

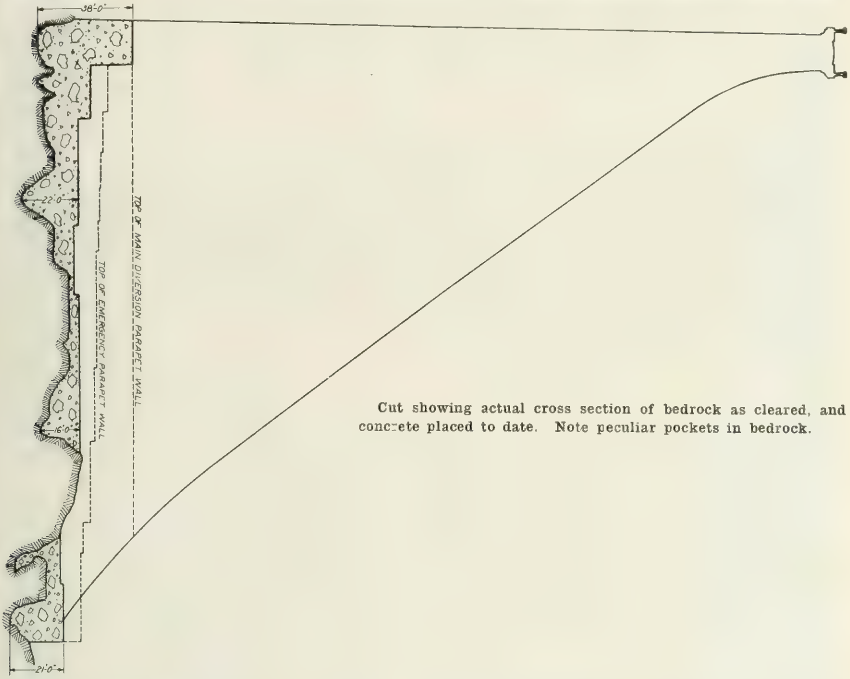
On October 28th, a little over two weeks before the work I have described was begun, a party headed by President Frank G. Drum and General Manager John A. Britton visited the Lake Spaulding - Bear River development territory and took occasion to perform the ceremony of laying the corner stone of the Lake Spaulding dam. The illustration herewith shows President Drum in the act of turning a spadeful of concrete into the small



Dam foundation (38 ft.) as it stands today.



Looking downstream at the dam site—picture shows diverting dam and flume before the flood.


38'-0"
22'-0"
16'-0"
21'-0"
TOP OF MAIN DIVERSION PARAPET WALL
TOP OF EMERGENCY PARAPET WALL

Cut showing actual cross section of bedrock as cleared, and concrete placed to date. Note peculiar pockets in bedrock.

pile of rock, while Mr. Britton stands by with a trowel. Other prominent figures in the picture are Messrs. F. G. Baum, engineer in charge of the Lake Spaulding-Bear River development, who is seen at the extreme left of the picture; R. G. Clifford, resident engineer at Spaulding, in the center; and P. M. Downing, Chief of the O. & M. Department, Hydro-electric Section, who is seen at the extreme right holding a pick in his hand. It was an eventful day for all concerned, and one that made history.

Paddy's Views on Electric Lighting

At the time of the first installation of electric lighting on battle-ships, an Irishman had occasion to help the electricians from time to time. Pat became interested in the work and asked several questions regarding how the lamps were lighted, what they lit them with, and so on. Upon completion of the work, a banquet was held. During the evening, the Irishman arose and said: "Gintlemen, I have worked on this ship, and I have assisted the electricians to put in the wires that carry the currents. Gintlemen, I have examined the wires, and for the Love of Mike, them holes must be very small that carries the currents to light them lamps!"

Cleaning the de Sabla Reservoir by Hydraulic Process

By I. B. ADAMS, Superintendent de Sabla Power Division.

I. B. Adams

On March 28th last the de Sabla Reservoir was emptied of water and preparations were made to clean out the mud and debris that had been accumulating there for a space of nine years.

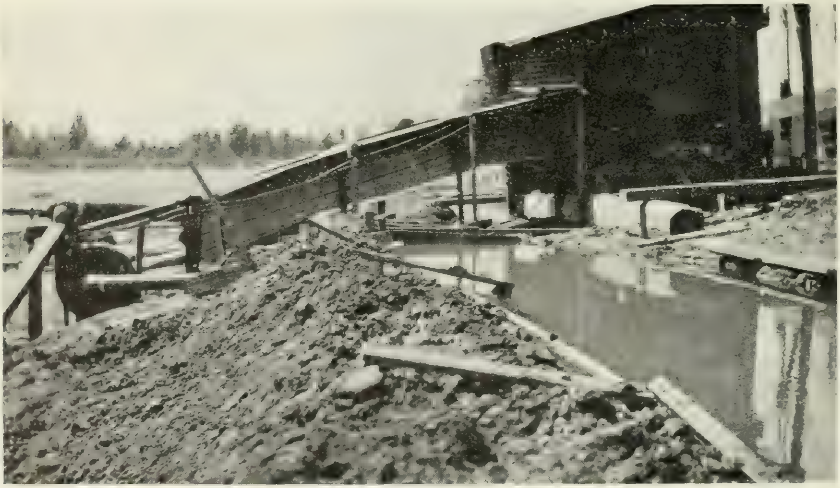
The interesting feature of this work was the re-appearance in the field of activities of the hydraulic monitor, a relic of the long ago. Time was when the monitor played upon rocky hillsides in the mining regions of the State, and before its compelling force boulders were like pebbles and mountains crumbled like snow-heaps. That was fifteen or twenty years ago, however.

But now another use has been found for this cast-off relic of the old mining days. You have been reading recently how the hydraulic monitor was used to clear space for the Drum power-house on Bear River; well, I want to tell you that its revival dated not from that construction work but from ours, several months previous.

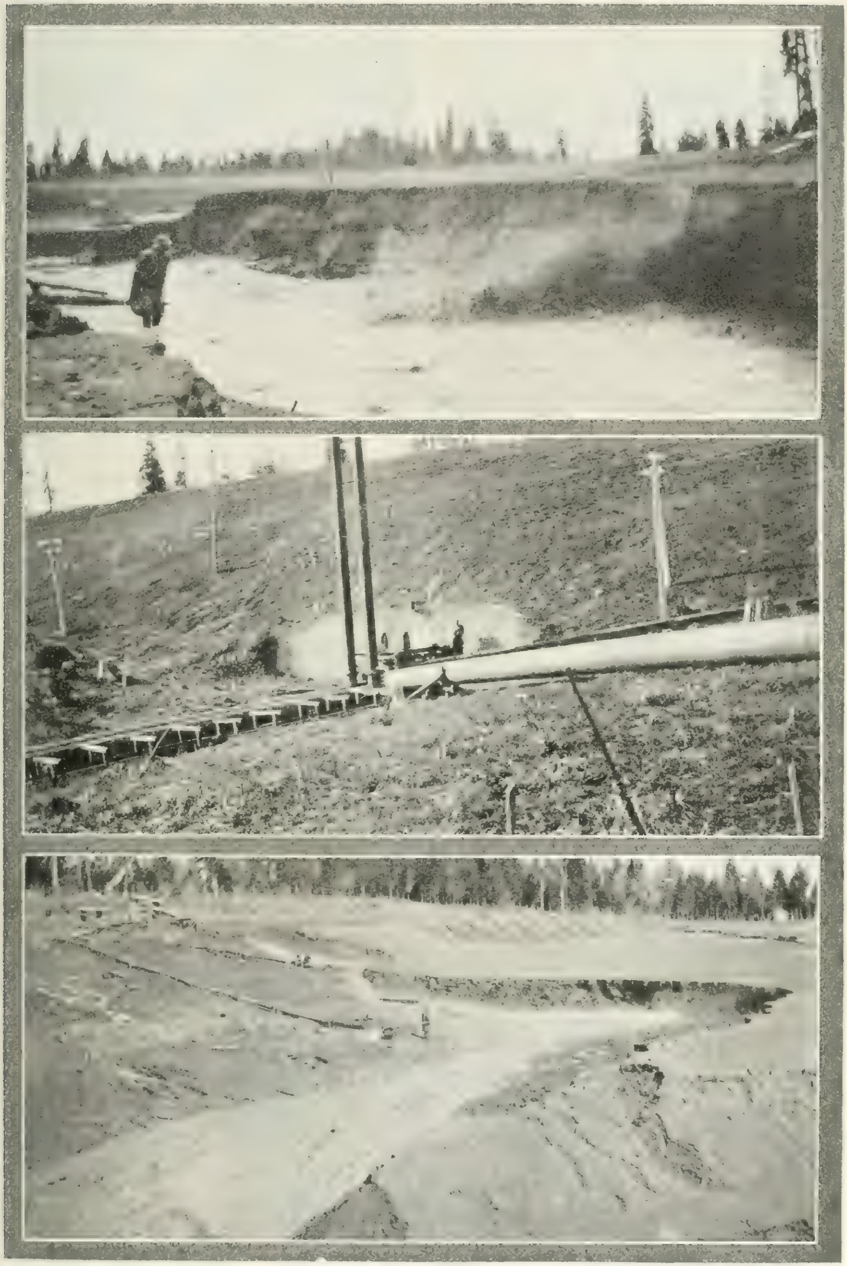
When we cleaned out the reservoir we found its bottom covered to a depth of from three to eighteen feet. Without the use of the hydraulic monitor it might have been a work of some magnitude to remove this large amount of useless material, in substance upward of 80,000 cubic yards, but as I said before the monitor did the trick and in short order.

I should mention that it took four of them to do it. We had Monitor No. 1, and Monitor No. 2, and two spare monitors to take their places on occasion.

To furnish the water and the necessary pressure for these monitors we had recourse to two centrifugal pumps. These were installed at the lower end of the reservoir, one on each side and located a few feet below high water



View of Pumping Plant No. 2 and ditch supplying it



Cleaning the De Sabla Reservoir. Reading from top to bottom the views show (1) Monitor No. 1 in Action, (2) Outlet pipes from the reservoir, (3) The upper end of the reservoir

Upper end of reservoir, 16 feet of debris

Looking across the reservoir

level. Two ditches, each capable of carrying 900 inches of water, were run from the Butte Creek ditch at the upper end of the reservoir and furnished water for the pumps. The water also was diverted at different places along the ditches and used as a sluice head to carry away the debris as the monitor cut it loose from the banks.

The overflow water from pumping plant No. 1 was carried through and around the dam in the flume and used to drive a 5500 kilowatt generator at the de Sabla power plant nearby. While the work of cleaning the reservoir was going on we were engaged also in rebuilding the transmission line between Centerville and de Sabla power houses, so that we were called upon not only to generate the power used for pumping but also for supplying the local 2300 volt circuit. This was done by using the overflow as mentioned above. A 14-inch pipe was laid from the flume and tapped into the manhole below the main gate on pipe line No. 2. To furnish power to drive the pumps a 2300-volt 3-phase circuit was run to each pumping station.

Scraper teams at work

Pumping plant No. 1 consisted of two 30 kilowatt transformers, one 75 horse power motor, and one six-inch high pressure centrifugal pump. The pump was driven at 1200 R. P. M. and delivered 1400 gallons per minute to a pressure at the pump of 75 pounds per square inch. Pumping plant No. 2 consisted of two 20-kilowatt transformers, one 40-horse power motor and one 5-inch centrifugal pump. This pump was driven at 1,000 R. P. M. at a pressure of 55 pounds. A $1\frac{1}{2}$-inch nozzle was used on each monitor.

By installing the pumps below the ditch we secured a forced suction on them, thus obviating the necessity of priming them after every shutdown. A 14-inch slip-joint iron pipe was used to convey water from the pumps to the monitors. As I have said, two extra monitors were on hand at all times. A Y-piece was inserted in the main pipe-line a short distance back of the monitor in use, and from this a pipe was run and the spare monitor set close to new ground. Whenever a monitor would wash away the dirt as far as the stream would reach the water would be diverted at the Y-piece and the monitor close to the bank would be placed in action. By using four monitors considerable time was saved. Two gangs of men were kept busy laying pipe and setting monitors all the time.

The de Sabla plant had to pull a full load over the evening peak, which put a stop to the hydraulicing every day from 4:30 p. m. to 11:30 p. m. Two shifts of men were used. For lighting purposes a 110-volt circuit was run to the monitors, and six 1200 candle power arc lights and fifty 16 candle-power incandescent lamps were used. At the upper end of the reservoir teams and scrapers were used to move some coarse material, sand and gravel. The teams were used also to scrape out the mile of ditch on each side of the reservoir.

The work was completed May 1st, twenty-nine actual days from the date of the start. In that time 80,651 cubic pards of material were moved. The photos from which the accompanying illustrations were made were taken at different stages of the work.

Electric Signs — As Editors See Them

[GEORGE FITCH, in the "San Francisco Call."]

An electric sign is a piece of long distance reading matter published at meter rates.

Electric signs are printed on the black night in neat golden letters and can be seen a great ways. By means of these signs the main street of a great city now looks like the advertising section of a popular magazine magnified a hundred times and set on fire. Electric signs are indigenous to America and when the Englishman arrives in this country and sees his first eruption of 32-candlepower remarks, he is afraid to walk up Broadway without a fire extinguisher.

Away back in the early ages of science, some ten years ago, electric signs were quiet and well behaved. But as competition grew keener some genius invented an electric sign which would wink. This was followed by a sign which went out for refreshments every half minute, thus leaving the world gasping for information until it returned. From this point signs became constantly more disorderly until an ordinary American business street looks like a Fourth of July celebration each night after dark. Incandescent horses haul chariots across the sky in mad races, incandescent champagne bottles shoot flaming red corks at Mars and dainty forty-foot legs kick holes in the zenith from the tops of twenty-story buildings. If Benjamin Franklin, who made the first timid overtures to electricity in the country, should return and gaze on New York at night, he would swear off on home-made wine forever.

Electric signs gather customers as electric lights gather moths, and when a citizen has once gotten fascinated by their antics it is impossible for him to tear himself away from them, The world is now full of flaming handwriting on the walls, but most of it is frivolous and doesn't improve our morals to any extent.

A 2200-Volt Industrial Installation

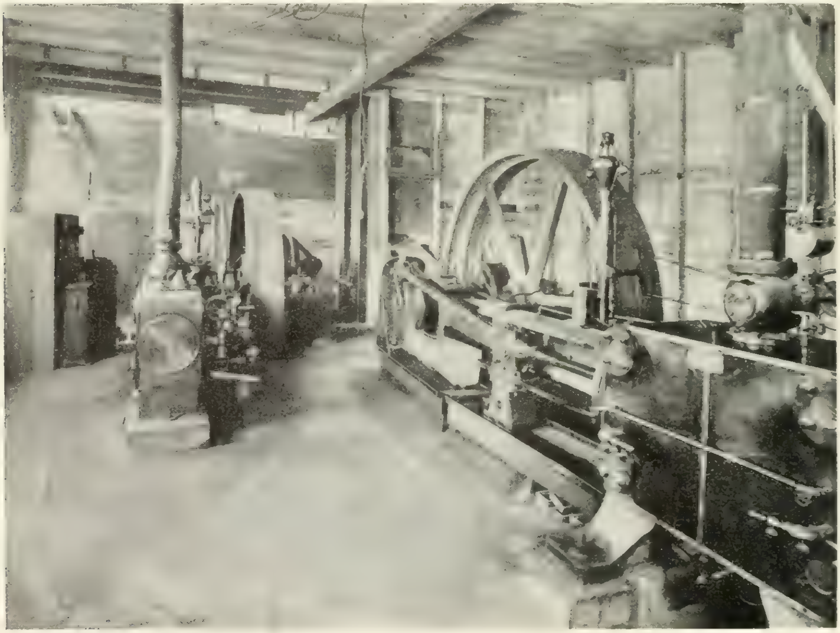
By A. L. HARRIS, Industrial Department

The installation of two motors, one of 100, the other of 150 H. P. capacity, in a brick manufacturing plant marks another transition from steam to electric drive, and the diminution in the amount of floor-space occupied demonstrates the economy in the concentration of power.

The relative floor space taken up by the two engines and boilers as compared with the electric motors is 7 to 1, with more than ample margin for motor and compartment. The motors were placed on their foundation ahead of the Corliss engines while running, connection between motors and compartment made underground, and when installation was completed, the belts were shortened leaving the engines and boilers ready for removal.

The 100 H. P. motor drives shafting connected to three dry pans, bucket belt elevator, belt conveyor, pug machine and minor auxiliary connections. The 150 H. P. motor is belted to an idler pulley on a brick machine and operation made by means of a friction rim clutch. By means of two motors and friction clutches repairs can be made to any machine during operation without closing down the plant in its entirety.

Brick making nowadays is almost automatic. The rock and clay are mixed and ground in the dry pan by means of a perforated rotating table, causing two heavy cast steel wheels to revolve in the opposite direction. A stationary blade spreads the mixture over the pan to utilize all the crushing weight of the moving solid steel



wheels. The mixture is then conveyed to a moving screen over the storage bin from which it drops into the pug machine. The latter is a mixing and kneading machine, effected by propeller blades on a shaft mixing and forcing the clay and water to the end of the machine. The hopper of the brick machine receives the clay, forcing it through the brick shape die (by means of close fitting knives on shaft of machine) on to a smooth steel table. As the brick-formed clay is forced forward, individual frames with the stretched cutting wire (on a revolving wheel) drop into place between roller openings on a moving chain, cutting the clay into the desired thickness of the brick. Continually forced on the clay bricks are picked up by a conveyor belt, carried to the second floor, and placed by hand on dryer cars. The bricks are air dried, the radiator heat from the kilns utilized to some extent, and after hours in the kiln the bricks are ready for the market. The plant has a daily capacity of 50,000 bricks.

The steam plant consumed 420 gallons of crude oil a day, necessitating pumping to and from storage tank, constant attention of engineer and large water consumption. The 2 H. P. motor, belted to the kiln oil pump and auxiliary pump, has been replaced by a 5 H. P. motor to carry additional load of a belted geared piston pump taking water from a well on the property and supplying all necessary water. The present installation requires starting and stopping; an automatic overload cut out protects the entire installation; and lubricating oil and water bills are eliminated.

By insuring absolute concentration of production and a wide flung network of distribution, the company again demonstrates that it is able to bring the cost of energy to the consumer down to a point which permits electric service in classes of work which a few years ago would have seemed impossible. Reduced prices and increasing sales, together with a high load factor, are winning converts to the use of electric energy every day, which in time surely will become a necessity of life in every form of industry.

"Pacific Service" stands always ready.

How Lineman Fieste Gave His Life to Save That of a Comrade

The following account of a tragic event appeared in the "Oakland Enquirer" of January 18. It speaks for itself and affords another instance of heroism and self-sacrifice which goes with "Pacific Service."

Berkeley, Jan. 18.—Howard C. Fieste, a lineman employed by the Pacific Gas and Electric Company, lies dead at the Berkeley branch morgue, the victim of self-sacrifice when he tried to save a fellow workman from electrocution in an accident which occurred late yesterday afternoon, January 17th, at San Pablo Avenue and Pardee Street.

"Val" J. Chisholm, for whom Fieste heroically gave his life, was saved and is at the Roosevelt Hospital in Berkeley, suffering from severe burns of the left wrist and right hand. He will recover. Fieste was one of a crew of a half dozen linemen who were employed in "re-stringing" old wire and overbanding primary and secondary wires in this vicinity. The fatal accident occurred when Chisholm was raising a length of wire to replace a section of an old arc circuit. He was high up in the air, leaning over the cross-arm of a pole. He endeavored to pass the wire over a high power cable which carried 4,400 volts. In reaching out over the cable he let his wrist touch it, and in an instant he stiffened and fell back. His body was held in check from falling thirty feet to the ground by his lineman's belt which was made fast to the pole.

Fieste saw the peril of his fellow-workman at a glance. He was two poles distant from Chisholm, and he thought the only way to save the latter's life would be to short the circuit by cutting the high power wire. So he went up from a secondary arm on which he was working to the primary arm and placed his pliers on one of the wires, but before he could carry out his intention his body convulsed with about 2,200 volts of electricity. His unconscious form dangled from the leather belt which he wore, and he hung in mid-air as the deadly current passed through his body.

Other workmen who were occupied nearby hurried to the rescue of the two men. Arthur Bigland, another lineman, quickly scaled the pole on which Fieste hung suspended and John Harris climbed to the assistance of Chisholm. At the risk of their lives the two men carried the now unconscious men to safety below. An emergency call was put in and Police Sergeant Thomas Woolley, Policeman Frank DePue and Policeman H. P. Lee hurried to the scene of the accident with the auto ambulance. Dr. Robert Hector and Dr. L. Shingle were also summoned from the Roosevelt Hospital.

The police officers administered first aid to the stricken men. They kept Fieste alive for nearly an hour by means of artificial respiration. Then the gas company rushed a pulmotor out to the men from its Oakland office. Chisholm was resuscitated by the time the doctors arrived on the scene with the pulmotor, and the modern life-saving agent was applied to Fieste in an effort to save his life. He was removed to a nearby drugstore and Dr. J. F. Diddle assisted with the work of resuscitation. But it was too late; Fieste died almost immediately.

He had gripped death when he tackled the wire to save his friend's life. According to fellow workers he knew the danger he took when he touched the live wire. In attempting to sever the high power cable he meant to cut the current between himself and the sub-station and thereby stop the "feed" which was endangering Chisholm's life. The pole on which he was at work was wet and proved an easy conductor for the circuit when he applied his snips.

Chisholm although badly burned will recover without any serious results. He lives at the Sherman house, Eighth street, Oakland. Foreman N. Nealy was in charge of the work which was being performed by the linemen.

Fieste was brave but fool-hardy. He did not use his rubber gloves, which were in his belt, though the pole and his clothing and tools were water-soaked from the heavy rain which was falling at the time. Also, Fieste tried to cut the wrong wire; that is, he tried to cut "C" phase of the circuit while Chisholm was across "A" phase, another wire entirely. He probably was much excited. The wire was so heavy it could not have been cut with pliers; in any event, the cutting would not have saved Chisholm.

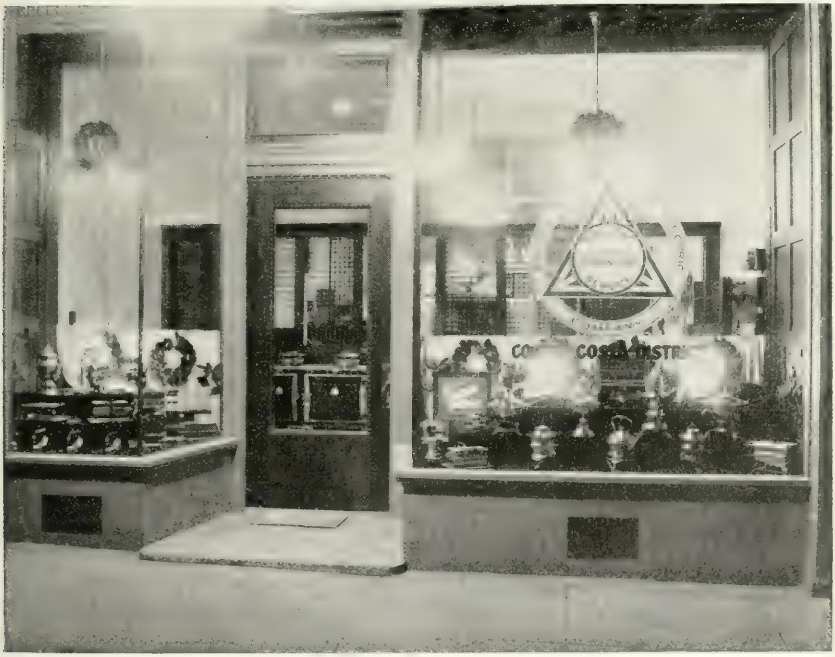
ITEMS OF GENERAL INTEREST

The enterprising up-to-dateness of Manager Don C. Ray of the Contra Costa district was strikingly revealed in the office at Martinez during the recent holidays. The show windows were tastefully decorated for the Yule time with an exhibit of electrical appliances of every useful kind, ranging in price from three dollars to twenty dollars and comprising everything from electrically heated shaving mugs to planished copper chafing dishes.

These brightly polished wares were displayed against a black velvet background and sprays of holly leaves and berries were scattered here and there to add cheer and give color. Large holly wreaths alternated with sprays of poinsettias, which with the glow of the Twin Glow Radiators gave a warmth and cheerfulness that was the admiration of all who had the pleasure of seeing the exhibit. A miniature electric illuminated sign "Electrical Christmas" fittingly suggested both the goods and the time.

The sales far exceeded expectations. Nearly the entire stock and part of the window display were sold for Christmas gifts. In the lobby of the office various electric ranges and cookers together with appliances were connected and displayed for practical demonstration.

It may be interesting to our readers to know that the photograph from which the accompanying cut was made, was taken after nine o'clock at night by electric light solely



Christmas display at our office in Martinez.

and alone, and that no extra or special installation was put in or used, but only the lights which are all shown in the photograph. Attention is also invited to the uniform and excellent lighting of the entire office, no excessive over illumination at one part with dark shadowy places in others. This office installation consists of Mazda Tungsten lamps with correct Holophane Glass Reflectors, giving economical and extremely satisfactory results.

The appliance show which was put on in Napa on January 9th, 10th and 11th had to compete with outside attractions. One of the rare California snow storms happened during the first day and the people were too busy snow balling to look at appliances. However with the poor weather conditions the daily attendance was good and the visitors were all interested. A number of sales were made and a large number of prospects secured. These will be called on later by the solicitors in the district and a large amount of additional business will be the result.

The cold weather was a boost for gas heating, many gas heaters being installed and a number of electric ones. The ease with which an electric heater can be operated appeals to a great many people as well as the fact that it is a new form of heating.

One result of the show was to impress on the minds of the people of Napa that "Pacific Service" is a live issue and that it is in business to give the public the best that can be had in both gas and electric service.

The window of the office was very nicely decorated by Mr. Brown and came in for a large amount of favorable comment.

Mrs. D. R. Withers demonstrated on both gas and electric appliances and served coffee and cake to all visitors.

The Christmas window display of the San Rafael office received many compliments and was one of the direct causes of the large sale of electric appliances in that district.

The decorations consisted of small appliances wrapped in Christmas packages and tied with red ribbons. A number of neatly lettered cards called attention to the uses and price of each article.

Mr. H. L. Eckenroth, solicitor in the district, was largely responsible for the success of the display.

On January 4th, the boys of St. Vincent's Orphanage were treated to moving pictures at the Lyric Theater in San Rafael.

Owners of automobiles were requested to donate their cars for the transportation of the little fellows from the Orphanage, which is located about four miles north of San Rafael.

As can be seen from the illustration "Pacific Service" played its part in the entertainment of the little unfortunates, Marin District's new Federal truck being used as the band wagon.

Another company car assisted in carrying the boys, of whom there were about two hundred and fifty. Over fifty automobiles were in line behind the band wagon.

The opening of the new office and salesroom of the Petaluma District was made the occasion of a large turnout of the consumers of "Pacific Service" in that district.

The storeroom formerly occupied by the office of the company has been remodeled and redecorated so that it looks like a new building. The rear part of the store is used for office purposes, while the front has a display of gas and electric appliances which would do credit to a much larger town.

The lighting, consisting of ten 250-watt Mazda lamps and four of the latest gas arcs, makes it the brightest spot in town. In addition to above four 100-watt lamps light the sidewalk, the whole being surmounted by a large "Pacific Service" sign in electric letters.

During the three days of the opening, held December 19th, 20th, and 21st, refreshments were served to all visitors. Mrs. D. R. With-

"Pacific Service" entertaining St. Vincent Orphanage boys.

ers had charge of this part of the show and supplied cake baked in a gas oven and coffee made in an electric perculator.

A great deal of interest was shown in the automatic water heater which was in operation on the floor. An electric range was also connected up and demonstrations were given for any one who was interested in this form of cooking.

As this was the holiday season much attention was paid to the small electric appliances and a number were sold for Christmas presents.

People living for a distance of several miles outside of Petaluma came in and many inquiries were made as to both gas and electric service.

The last night of the demonstration after the office had been closed to the public a dinner was given to the employes of the district. The table was laid for twenty and an attractive menu was served.

The table decorations were electric light in Christmas colors and Pacific Gas and Electric Company in electric letters.

Manager Herman Weber occupied the head of the table and acted as toastmaster. The dinner was prepared in the office by Mrs. Withers, assisted by the entire office force. Both gas and electricity were used and the result left nothing to be desired.

Another successful appliance show and demonstration was held January 2nd, 3rd, and 4th at Santa Rosa. The occasion was the opening of the remodeled office and display room, and as it was so close to the holiday season it was considered as a New Year's reception to the consumers of "Pacific Service" in this district.

The office, with the beautiful new lighting and large display of appliances set off by attractive floral decorations, took on the appearance of welcoming everybody in Santa Rosa to come in and help celebrate the New Year. Invitations were sent to everybody in and around the city stating that the office would be open from two to nine each day. So many thought that it meant all day that it was necessary to open at about ten in the morning and continute until eleven at night. During all of this time refreshments were served to all visitors and the use of the gas range was demonstrated by Mrs. D. R. Withers.

Much interest was shown in the small electric appliances and in the gas water heaters. A large number of sales were made and a good number of live prospects secured. The latter will be followed up by our solicitors in the district and will no doubt result in a number of appliances being sold. The window was decorated as a kitchen with a lady ironing with an electric iron. The idea was suggested by Miss Abrams of the local office and made a decided hit.

Saturday night after the demonstration had closed a dinner was given to the employes of the district. The table was set for forty-two and was nicely decorated with electric lights and flowers. The company emblem was made of electric lights and hung over the center of the table. Manager M. G. Hall acted as toastmaster and made a number of remarks about the demonstration and the results which had been obtained by "Pacific Service" during the past year. Short talks were made by a number of others present and the balance of the evening was enjoyed in story telling and a general good time. During the dinner it was suggested that a local organization of the employes be formed under the title of the "Pacific Service" Club of the Santa Rosa district. The "Get-together" spirit is everywhere.

'Pacific Service'' appliance exhibit at Santa Rosa.

Noting Progress of the World's Fair

Two distinguished representatives of foreign countries visited San Francisco early in January to look over the Panama-Pacific Exposition site and report thereon to their respective governments.

A site for Spain's exhibit was chosen tentatively by the Marques de la Vega Inclan, who traveled out here for the purpose at the bidding of his royal master, King Alfonso. The eminent Spanish nobleman expressed himself delighted with the prospects for the great Exposition, and at receptions given by both the Exposition directors and residents of the local Spanish colony, assured all that his Parliament would pass an appropriation sufficient to enable his country to be worthily represented here in 1915.

M. Jean de Pulligny, a famous French engineer, came out from New York under orders from his government to look over the site and submit a report thereon. He stayed here several days and before leaving spoke sincere words of praise for the great Western undertaking.

"France was one of the first nations to accept the invitation of your city to participate," he said. "She must have a splendid site and building to measure up to the beautiful site you have provided. The general location is advantageous. It is convenient to the center of the city. It has a wonderful outlook and is an admirable piece of level ground. A great deal of work has been accomplished. The filling and reclamation work has advanced splendidly.

"France will do her share. We shall not delay. Probably a site will be chosen in less than two months."

The State Department at Washington sent joy to the hearts of the Exposition directors by the official announcement that the Argentine Republic had decided not only to participate in the Exposition but to be represented on an elaborate scale. This is good news indeed. Every Central American country has accepted the President's invitation to participate, and now the intelligence that the Argentine Republic will take part is accepted as an indication that all the countries of South America will fall in line.

Following is a list of concessions already granted by the Exposition Committee on Concessions and Admissions, with the amount of investment each represents:

'49 Camp	$ 100,000
Panama Canal	150,000
Grand Trianon	50,000
Ice Palace	75,000
Infant Incubator	50,000
Grand Canon of Arizona	250,000
Evolution of the Dreadnought	150,000
Aerograph	60,000
"Creation"	160,000
Total	$1,045,000

Permission has been granted to the National Association of Automobile Manufacturers to erect a Motor Transportation Building on the Exposition site. This structure is to house the most attractive automobile show ever held in the world, and which is to last through the entire period of the Exposition. The building will be located south of the Machinery Palace and will be of the most modern design. The sum of $90,000 will be expended on the interior decorations. The structure will occupy approximately 5 acres of ground.

President Moore has appointed Theodore Hardee Chief of the Department of Liberal Arts. The appointee has had a wide experience in exposition matters. He played a prominent part in the St. Louis World's Fair of 1904 and in the Lewis and Clark Exposition in Portland, three years later. Mr. W. W. Chapin, publisher of the "San Francisco Call," has been elected to fill the vacancy on the Board of Directors caused by the resignation of Mr. C. W. Hornick.

Within a very short time the gates to the Exposition site will be closed and visitors will be called upon to pay an admission to enter the grounds and watch the work of construction. The fence is already up and it covers 2 1-3 miles.

DOINGS OF OUR COMPANY SECTION N. E. L. A.

OFFICERS AND STANDING COMMITTEES 1912-1913

OFFICERS

Chairman: A. R. Thompson, San Francisco, Cal.
Vice-Chairman: J. D. Kuster, San Jose, Cal.
Secy.-Treas.: Henry Bostwick, San Francisco, Cal.

EXECUTIVE COMMITTEE

S. V. Walton, San Francisco, Cal.
C. J. Wilson, San Francisco, Cal.
F. H. Varney, San Francisco, Cal.
Geo. H. Bragg, San Francisco, Cal.
R. C. Powell, Oakland, Cal.

STANDING COMMITTEES

Papers and Meetings:
S. V. Walton, Chairman, San Francisco, Cal.

Membership:
F. H. Varney, Chairman, San Francisco, Cal.

Question Box:
C. J. Wilson, Chairman, San Francisco, Cal.

Editorial:
H. Bostwick, Chairman, San Francisco, Cal.

The regular monthly meeting of the "Pacific Service" Section of the National Electric Light Association was called to order at 8 o'clock p. m., January 15th, 1913, Chairman Thompson presiding. About 250 members attended.

The minutes of the previous meeting of December 18th, as well as those of the executive committee meetings held January 7th and January 15th, were read and approved. Reports of the standing committees being called for, Chairmen Varney of the Membership Committee, Walton of the Papers and Meetings Committee, Wilson of the Question Box Committee and Bostwick of the Editorial Committee reported progress.

The next order of business being the presentation of papers or lectures, Chairman Thompson announced that Prof. C. L. Cory of the University of California had consented to give a short address. Prof. Cory was then introduced and gave a very interesting talk along the lines of welfare work and the great good to be accomplished by such an organization as our Company Section through the "get-together" spirit which is fostered at our meetings, where all members appear on a common plane and no distinguishing lines are drawn. In the course of his remarks Prof. Cory invited all present to call upon him or the University at any time for any assistance that could be rendered our Company Section or its individual members.

A vote of thanks was tendered Prof. Cory at the conclusion of his address.

The Chairman then called upon Messrs. P. M. Downing, Werry, of Nevada City; Osborn of Woodland, Sedgwick of Dixon, and Baldwin of Sacramento, all of whom expressed themselves as being very much gratified at the progress made by the Section and the great interest taken in its affairs as evidenced by the large attendance.

There being no further business, the meeting adjourned. Chairman Walton of the Papers and Meetings Committee then took hold and a varied entertainment was much enjoyed by all present.

Henry Bostwick, Sec'y.

Notes — By the Editorial Committee

The officers of the Section wish to express to the members their appreciation of the interest taken by them in the work of the Section, and would state that it is equally gratifying to the Management of the Company.

It will be the earnest endeavor of the Executive Committee to make each successive meeting of our Section more interesting from every point of view.

It has been remarked that our genial Mr. Walton should have been a "vaudeville impressario."

If any of the members have any "pearls of thought" which they would like to disseminate for the general welfare of the "Pacific Service" Section, we would be glad to receive them.

Our "bear cat," Pitts, failed us at our last meeting, but promises that when he is hereafter called upon he "will be there with bells."

Our membership roll has not reached the 500 mark as yet; but Chairman Varney of the Membership Committee has something "up his sleeve." When that steam roller cuts loose, look out.

Johnny Werry of Nevada City did his best in the absence of his music, but he says "never again" without the music, and the next time he will be "loaded for bear."

O. & M. DEPARTMENT, (STEAM SECTION).

An active campaign is being conducted in this department for the enrollment of new members in the Company Section of the National Electric Light Association, as we think every man should be a member of this efficient organization. There is a nominal yearly membership fee of $5.00, which, we are sure, will not deter any of us from joining. The benefits derived from participating in these monthly meetings, the value of the monthly bulletins, the incentive for writing thoughtful papers on our work, these and many more advantages cannot be estimated in dollars and cents.

While perhaps not generally known, these monthly meetings are made possible only through the generous policy of the Management, for unlike the Electrical, Mechanical or Civil Engineering Societies, no part of the revenue derived from the membership fees of the N. E. L. A. is set aside to defray the expenses of the local branch, so that we must be self-supporting. We have our being as a Company Section, therefore, solely through the support of our Management, and we must do our part by increasing the membership roll and lending a helping hand in any way possible to make the Company Section a success, in order to show our appreciation of those silent forces which make it possible for us to meet the men on the firing line in every department at least once a month and enable us to do our share in cementing together the foundation stones of our organization—TEAM WORK.

Your attention is invited to the first appearance of our Question Box in this issue. If you find any difficulty in answering any of the questions asked, ruffle Chairman Wilson by propounding some new questions, for that is what he thrives on.

OAKLAND DISTRICT.

We think the formation of a Company Section of the N. E. L. A. is a good thing. This good thing should be passed along until all who are interested in the welfare of the P. G. & E. are brought within the circle to the end that "Perfect Service" becomes an accomplished fact.

This must not be a theory. "Theory never drove a nail; it takes a hammer to do that." So if the Pacific Gas and Electric Company furnishes us with the nails and other materials to build up this "Perfect Service," let us see to it that we, one and all of us, do the hammering until each piece of material is in proper place and every nail is driven home to the head, thus forming a compact, united and perfect service.

We would suggest a Trouble and Experience Department might prove a valuable adjunct to the Question Box. We all have troubles and we all have experiences. These should be helpful, especially when we recognize that the school of experience is the greatest teacher.

In the after-glow of our January meeting we are impressed by the large number of those who were present. Each one there represented a particular line of work. That work to him was paramount. He was there as a representative of that work. If perchance that work had become a little monotonous—had become a little humdrum—he certainly went back to it with renewed spirit. He felt the inspiration of a sonata; the single note became the symphony itself—Perfect Service.

This mixing up with the other fellow called Fellowship, has a wonderfully invigorating effect; especially when the other fellow is big and broad in experience and you can measure up your own short comings. So we all came back from the meeting satisfied that we are going to get a lot out of the N. E. L. A.

Mr. E. B. Price of the Steam Section, O. & M. Department, has been appointed Chairman of the Reception Committee. Ernest has a taking way, and we are sure that he will fill his position in a satisfactory and dignified manner.

O. & M. DEPARTMENT, (HYDRO).

We think that a little later in the spring it would be a good idea to form a league of teams to play baseball, selected from the different departments. Those departments not large enough to boast of a team themselves could consolidate with some other small department. We think that we could have at least four or six fairly good teams in which there would be friendly rivalry between the different departments. Our idea would be to have the head of each department play with his respective team.

The Executive Committee is looking into the matter of a suitable button or badge for the use of the members.

To such of our employees who have not sent forward their application, we say "Do It Now."

There is a saying: "When in Rome be a Roman," which has suggested to us a more apropos one: "While in 'Pacific Service' be interested in the work of the 'Pacific Service' Section of the N. E. L. A.

A list of all members in attendance at each meeting will be made, the matter of a permanent record.

Those "get acquainted" cards made "some hit."

? QUESTION BOX ?

PACIFIC SERVICE SECTION N. E. L. A.

C. J. WILSON, Chairman, Question Box Committee

All correspondence relative to the Question Box should be sent to C. J. WILSON, CHAIRMAN OF QUESTION BOX COMMITTEE, C/O PACIFIC GAS & ELECTRIC CO., 445 SUTTER STREET, SAN FRANCISCO.

Contributions received prior to the 20th of the month will be published in the issue of the Magazine of the following month.

Each question should be submitted on a separate sheet of paper, preferably typewritten. Sketches, diagrams, etc., which accompany questions or answers, should be made with black drawing ink on white paper; letters and figures being of suitable size for reduction. All questions and answers submitted should bear the name of the person submitting same. Questions will be published without the name of the propounder. Answers will be published with the name of the member answering same.

EDITORIAL:—In presenting the first issue of the Question Box of the Company Section, it is desirable to briefly outline its purposes and application.

This Question Box is intended primarily to provide a direct means of obtaining information concerning problems, practices, methods and policies of the Company which will be of value and interest to employees. It provides a means by which an employee of any department may obtain information regarding the methods and practices in use in other departments and districts.

The matter presented in our Question Box is intended to supplement the well known Question Box published monthly in the N. E. L. A. Bulletin rather than to attempt to cover the same field, and it is the aim of your Committee to publish such questions and answers as may prove of particular interest to employees of "Pacific Service." This will necessarily limit our Question Box to the fields of activity in which our Company is engaged.

It is to be expected that certain questions of national interest will be received which can best be answered from the wider field reached by the parent organization and such questions will therefore be forwarded to the editor of the N. E. L. A. Question Box.

Owing to the limited space allotted to the Question Box in this issue of "Pacific Service," certain questions which have been received have, of necessity, been withheld and will appear in a later issue of the Magazine.

To correct an impression that seems to be abroad to the effect that the Question Box Committee has assumed the responsibility of answering all questions submitted, your Committee feels that the purpose of the Question Box will be far better served if answers are received directly from those employees who have had training and experience in the particular field covered by the question.

Following the system of classification used by the Editor of the N. E. L. A. Question Box, all questions received will be classified by the Dewey Decimal System which is now in use by practically all of the up-to-date libraries in this country, including all important technical libraries. This system, a skeleton form of which was published in the October and December issues of N. E. L. A. Bulletin, has been used in various modified forms by such concerns as H. M. Byllesby Company and Stone and Webster, by a number of railroad systems and in the libraries of many European capitals. The Decimal system may be said to embody the concentrated knowledge and experience of the best library experts in the world. This system was adopted for the N. E. L. A. Question Box after a most careful investigation into the various systems in vogue and we can make no mistake in following the system adopted by the parent organization.

The earnest co-operation of every member is solicited both in presentation of questions and promptly answering questions which have been published in the Question Box.

GENERAL.

0-1 Why will concrete not set well when mixed with sea water?

0-2 How are the electric switches on the Market Street car system operated and what connections are required in order that a McAllister Street car will open the switch at McAllister while a Hayes Street car will pass this switch but open the one at Hayes Street?

HYDRO-ELECTRIC.

1.2-1 What will be the difference in level between top of tunnel portal and crest of spillway?

1.2-2 What will be the storage capacity of Lake Spaulding from top of tunnel portal to crest of spillway?

1.2-6 What is the annual run-off of the drainage area drained by the South Yuba and located above the new Spaulding Dam?

ELECTRICAL ENGINEERING.

Dynamo Electric Machinery.

1.313-1 Why is it that DC motors can be operated at variable speeds and AC motors can only be operated at constant speed?

1.313-2 Can a motor be made to operate on both AC and DC and 110 and 220 volts?

1.3133-1 Three-phase current is wanted for testing purposes, where only a single-phase supply is available. Can a three-phase induction motor, brought up to speed by some means and then run single-phase, be used successfully as a phase converter?

1.31331 What are the functions of reactance coils on a turbo-generator and how are these functions performed?

1.31334 What are Mercury arc rectifiers, when are they used and for what purpose?

TRANSFORMERS.

1.31343-2 Please explain why a current transformer gives a much higher voltage across the secondary on open circuit than on closed circuit.

1.31343-3 What action takes place when a transformer is out on the line working, to make the compound deposit from the core to case through the oil? I might add that this compound will not adhere to side of an iron receptacle unless held there with the oil at a temperature of 130° C. The compound will fall to bottom of receptacle.

1.31343-4 What is the reason for providing such large air space between the primary and secondary in some current transformers, and thereby increasing the resistance and reactance of the primary winding? This feature seems to apply more or less to all current transformers but is particularly prominent in the GE K8 & Westinghouse type E.

TRANSMISSION AND DISTRIBUTION SYSTEMS.

1.3211 Would like to know some practical method of locating a ground on a DC two wire network where both positive and negative sides are to be kept clear of grounds. Service must not be interrupted while locating the ground.

1.3212-1 What are the advantages or disadvantages in using 11,000 volt primary for distribution, both light and power, in a city with a population of 125,000.

1.3212-2 What is the cause of a 4 KV line burning down close to the Station when the actual short is about a half mile away?

1.3221-1 Why does star connection of distribution line cause less induction on an adjacent telephone line than delta connection?

1.3221-2 Would the ordinary Locust insulator pin (size 1½" x 9") be strengthened and its life increased if it were dipped in boiling Linseed oil or some other suitable oil?

1.32222 What is the best way to cool a transformer manhole which stays excessively warm?

PROTECTIVE DEVICES.

1.3282 What is the general practice of the Company with regard to grounding the secondaries?

1.3283 A consumer having a 220 V. 2-wire service fused with 10 amp. fuse connects a 110 V. 500-Watt electric iron to a lamp socket. What will be the effect on the iron and fuse? Assuming that he connects a 110 V. 40-watt lamp to the above socket, what will be the result?

ILLUMINATION.

1.331 In a room 100′ x 150′ with ceiling from 14′-20′ high, what effect does the height of units have on the illumination?

(a) With direct lighting units.

(b) With indirect lighting units.

DOMESTIC APPLIANCES.

1.34112 How should the Company meet the inquiry of consumers for cooking by electricity?

(a) Is it desirable business?

(b) What would be the effect on distribution systems, assuming an average load of 5000 watts per consumer?

(c) What rate would make electric cooking economical to the consumer, and what minimum would be necessary per 1000 watts installed?

MOTOR DRIVES.

1.342 What type of motor should be used to drive a pump supplying a house tank and operating under the following conditions? The motor is started and stopped automatically when the pressure in the tank gets below or above the desired limits, and the tank is so small that for a large portion of the day, the motor will run for 3 or 4 minutes, then stop for 2 or 3 minutes, that is, the motor wil be started once in from 5 to 7 minutes. The horsepower required is 7½, and the available supply is 550 volts DC and 220 volts, 60 cyc. single-phase.

METERS.

1.372-1 (See Fig. 1) What combination of circuits would make the above meter run backwards?

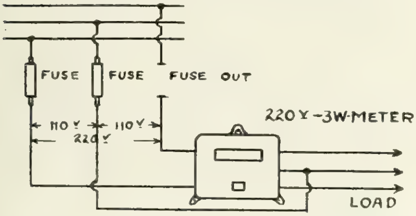


FIG. 1 — 1.372-1

1.372-2 Should each of the three single-phase meters in a primary installation supplying two transformers connected open delta, register the same amount of power? The load consists of three-phase motors. There are three potential transformers connected to an artificial neutral, and three current transformers with one side common.

1.373-1 How can a service which supplies 440, 330, 220 and 110 volts (all single-phase) to a consumer be metered on the secondary with the smallest number of meters?

1.373-2 (See Fig. 2) What would be the multiplying constant for a 220 volt 2-wire meter connected as shown, to a 220 volt single-phase, 3-wire load, the sec. of current trans., (20 to 1 ratio) being in multiple and the meter potential connected across one hot leg and neutral?

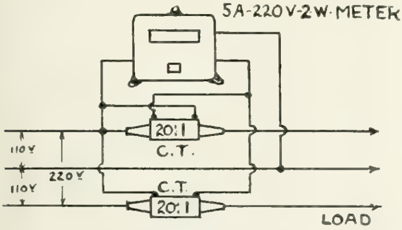


FIG. 2 - 1373-2

Splendid Activity in California

Under the heading "Splendid Activity in California" the N. E. L. A. Bulletin for January publishes the following:

During the past three months the employees of the Pacific Gas and Electric Company of San Francisco have been rallying in great numbers and enthusiasm to the banner of the National Electric Light Association. The new company section already promises to be one of the largest. Last October there were but 81 members enrolled, but at the second regular meeting, held on the evening of December 18, the membership was no less than 401. It is already predicted that the membership will reach 500 by the time of the next stated meeting—January 15. The excellent monthly bulletin devoted to the affairs of the company now includes N. E. L. A. work in its regular contents, and the officers of the company are giving the movement their fullest possible support. Mr. Henry Bostwick, the secretary of the section, writes us: "At our meeting on the evening of December 18, which was what might be termed an organization meeting, we had approximately 200 members present, without any other endeavor on our part than the mere announcement of a meeting. To say the least, we are all very much gratified to see the great interest that has been taken on the part of all our employees in this movement."

Pacific Service Magazine

PUBLISHED IN THE INTERESTS OF ALL THE EMPLOYEES
OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON - - - - EDITOR-IN-CHIEF
FREDERICK S. MYRTLE - - MANAGING EDITOR
A. F. HOCKENBEAMER - - BUSINESS MANAGER

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

VOL. IV FEBRUARY, 1913 No. 9

EDITORIAL

FOLLOWING CLOSE UPON THE HEELS of the New Year came an unwelcome visitor to California in the form of a cold spell which stayed with us several days and retired only to give place to a storm of snow and rain and wind.

That great damage to the agricultural industry has resulted cannot be denied. Various estimates are made, all of them well up into the millions. But, strange to relate, it is the southern part of our State that has suffered the most. Reports from south of Tehachapi indicate almost total destruction of the citrus fruit on the trees in many localities, while none escaped severe loss. But in what is commonly regarded as the cold and inclement north reports indicate that the injury has been comparatively trifling.

From Shasta comes the intelligence that what heavy snows have fallen only insure more water for the crops of next season. Statements of a similar description are to hand from Humboldt, Butte, Amador and Nevada counties. It is even stated in places that the farmers are doing more rejoicing than complaining; that while a certain amount of damage was wrought by the cold spell, the heavy rains which followed were most beneficial. Citrus fruits in central and northern California suffered little or no loss, according to the reports from various districts, the crops having been marketed before the frosts came, while the dairying regions, the grape country and the cattle lands were unaffected by the storm. Some reports go so far as to state that the rains have greatly benefited crops and that farmers expect a record-breaking year.

Making due allowance for the tendency of human nature to exaggerate conditions, one way or the other, from the standpoint of self interest, the recent elemental visitation undoubtedly has opened the eyes of the world to the desirability of north-central California for the prospective investor. It is indeed a pity that the men of our section have proved so retiring in the past, so backward in letting the outside world know of the really wondrous attractiveness of the country they inhabit. As has been stated repeatedly at banquets and in books, they have allowed their more enterprising brethren from the southland to spread literature all over the east and abroad, with the result that even today it is supposed that California in her warm, genial, semi-tropical splendor exists not north of the Tehachapi Pass. That is all wrong, of course, and now that we are awakened to a realization of what has been done we are taking our time about correcting it.

But we venture to think that the recent storm has done more for us of north-central California than any literature we might be spreading broadcast to the world. It is hard to go behind statistics, as a rule, and statistics are in our favor. Last December there was held an orange carnival at Oroville, and visitors were regaled with a spectacle they will not readily forget. The pavilion was festooned, garlanded, decorated in every possible fashion and after every possible design with great, ripe oranges, and grape fruit, and apples and other magnificent products plucked from the trees in surrounding orchards. And then a fact was learned which the recent storm has driven home, namely, that oranges ripen in that section of the country from six weeks to two months earlier than in the so-called semi-tropical region of the southland. And it was this condition that saved the farmers when Jack Frost came upon us. The citrus fruit was all harvested and in the market. All the world knows that now.

This then, promises to be a great year for our section of California.

Cries for help are heard from the southern city of Pasadena, whose residents are reported to be growing restless under a continued loss of business by the municipal electric lighting plant. The city authorities have made a remarkable plea for assistance to the State Railroad Commission in the shape of a complaint against the Edison Company doing business in that territory, alleging that the latter has established rates so low as to practically run the municipal plant out of business.

According to the published report of the municipal plant for the year ending June 30th, 1912, its operation resulted in a profit. The report of the City Auditor, however, showed that both interest and sinking fund on the bonds were paid from the general tax levy and not from the earnings of the plant. Furthermore, there was an omission of many items properly chargeable to operating expenses and which would be rigorously exacted from any public service corporation before the investing public would think of accepting its financial report. No explanation was offered of the fact that the report showed a total investment of nearly $600,000 as against just $325,000 authorized by the votes of the people.

This is one of the numerous cases that are being brought to light daily, and while on this subject we think it would be not amiss to reproduce an editorial in a recent issue of the "Saturday Evening Post," as follows:

"Twenty-five years ago American cities still believed in competing public utilities. It was thought desirable for a city to have two or three gas and electric light and even street car companies, on the theory that competition among them would keep prices down. Nobody nowadays believes in competition in those things, and advocates of competition as a universal regulator seek to except certain things from the general rule by calling them "natural monopolies," a phrase which means mainly that the waste of competition and the benefit of concentration have been indisputably proved by experience in this particular field.

"Practically the whole country of late years has come to regard railroad transportation as another natural monopoly. Everybody knows that for years there has been no competition among railroads as to rates, which are fixed at a uniform schedule by agreement among the roads. This is contrary to law, as the Supreme Court has so far interpreted the Sherman Act; but no one seeks to prevent it because every one realizes that actual rate competition among the roads would be a calamity. The Government itself, though attacking industrial combinations right and left, makes no attempt to force the railroads into rate competition. It seeks merely to see that the rates which have been agreed upon shall be reasonable, and with that the public is content. Both as to railroads and public utilities, combination and co-operation are universally regarded as natural and beneficial.

"It is only in manufacturing and merchandising that concentration is regarded as unnatural and baneful; but in those fields, as President Van Hise, of Wisconsin University, has pointed out with much detail, competition, in fact, is breaking down. Our pure-food laws, for example, are an abandonment of the old theory that competition among manufacturers will secure to the consumer the best possible goods at the lowest possible price.

"Every one will presently realize that combination and co-operation may be as useful and natural elsewhere as in gas manufacturing, electric lighting and railroading."

PERSONALS

Messrs. Lee H. Newbert, Manager of the Appliance Department, and H. P. Pitts, Industrial Engineer, attended the annual convention of the National Commercial Gas Association, which was held at Atlanta, Georgia in December. As every one knows, this association represents the sales end of the gas industry.

"The convention was held in the Auditorium and the display of gas appliances was the greatest in history," reported Messrs. Newbert and Pitts on their return. "The lighting in the Auditorium was done by gas and was the most beautiful display in gas lighting on record. The papers read were of the highest order. Among the best were one on 'Gas for House Heating,' one on 'Education of Gas Salesmen' and one on 'Proper Advertising in all its Branches.' The amusement features were very ably handled. Our San Francisco delegation was assured that the 1915 Convention will be held in San Francisco in conjunction with the promised International Gas Congress."

On leaving Atlanta Messrs. Newbert and Pitts visited a number of cities, including Washington, New York, Boston, Rochester, Chicago and Kansas City, with a view to learning the different methods of securing business. They were royally entertained everywhere they went.

"Pacific Service" regrets to lose Miss Flora M. Austin, telephone operator, who is about to be married. If readers of our magazine will consult the issue of June, 1911, they will learn something about Miss Austin that will enable them to realize how we hate to lose her. Under the heading "Women of the Company" Mr. R. J. Cantrell tells of Miss Austin's bravery at the time of the great calamity of 1906. She was at her desk in the telephone room in the old Post Street office of the San Francisco Gas and Electric Company when the first severe shock was felt, and though the switchboard "went dead" and she was unable to call for help she notified the inspector on duty in the building to shut off the gas, and while the whole city was in a state of turmoil she remained at her post until half past eight in the morning when she was forced to leave.

The bridegroom-elect is Mr. P. J. Heintz, proprietor of the California Mirror and Beveling Works of San Francisco. The marriage is to take place immediately.

November 24th, last, Mr. A. R. Tobitt, of the Electrical Distribution Department, San Francisco district, was joined in wedlock to Miss Irene M. Lynch, of this city. We all wish Mr. and Mrs. Tobitt every happiness.

Announcement was made in the last issue of the magazine of the accident to Mr. F. C. Ensinger, Superintendent of Electric Meter Department. Mr. Ensinger is suffering from the after effects of an operation, but we look for his speedy convalescence.

Mr. C. E. Larrabee, of the Electric Distribution Department, has been called away to the East to attend the bedside of his father, who is very ill.

The front cover design for the present issue of the magazine affords a view of Blue Lake, above Lake Spaulding, one of a chain of reservoirs owned and operated by our company in the Sierras. The dam was built by the Meager Mining Company some time before 1871, in which year John Spaulding purchased that and a number of other lakes. Its maximum area is 63 acres and its maximum capacity 48,950,400 cubic feet.

Interpole Machine Workings

By THOS. E. FOGALSANG, O. & M. Dept. Steam Section.

T. E. Fogalsang

Since the advent of interpole wound generators and motors, the troubles that generally accompany any new proposition have made themselves manifest. These have occurred in different parts of the country, and under various forms of operation and load.

Who is there among us that has not seen all kinds of troubles in new machines of the series, shunt and compound wound types when operated for the first time? And have we not seen those same machines work properly and perfectly, and without being redesigned or rebuilt. How often has the trouble been found to be a mere trifle, like a bad setting of the carbon brushes, a short-circuited field coil, or a ground in the commutator? Sometimes the trouble has been due to big things, but more often to little.

There seems to be a failing among operating engineers, electrical men especially, to want to discover that some big thing is the matter. Instead of looking for some small trouble about a piece of bad-acting apparatus, something that can, perhaps, be remedied in a short space of time, they are too prone to lay it to bad design, or poor workmanship at the factory, never thinking that hundreds of the same type may be operating successfully in other places.

With the coming of the interpole type of machine we are, no doubt, destined to have to find out a few things for ourselves, and in looking for those faults, we had better, like we did when we were little, creep before we try to walk.

The interpole machine has its own characteristics that require study, but the results to be obtained will be ample reward for studious efforts. When a new machine arrives and is to be put into operation, care must be taken to see that it is properly assembled, for it is not always a certainty that it has been run under full load at the factory. If it is a machine of large capacity the connections on the compound and interpole windings should be gone over thoroughly, to see that they make good contact and are free from varnish. The field windings, shunt, compound, and interpole, should be carefully tested for polarity, to see that each will do its proper work. The brushes should be fitted very accurately, and placed equidistant around the commutator. Count the number of segments in the commutator, divide that number by the number of poles in the field, and the result is the number of segments from brush toe to brush toe.

Great care should be taken with this part of the work, for upon the proper setting of the brushes depends the successful operation of the machine. It will be little use to have interpoles on a generator or motor, if the iron of the same does not work upon the coils that are short circuited by the brushes, and keep down sparking. The successful operation of interpole machines depends a great deal upon the proper setting and maintenance of the brushes.

If the machine be a simple shunt, less trouble will probably result than with a compound wound one. But even in such a case, the interpole winding may have to be altered by the use of a shunt. Too strong an interpole field may affect the shunt field, while too weak a one may allow sparking. If it is a compound wound machine, operating in parallel with others, shunt or compound, and storage batteries, the characteristics of the machine may have to be studied for some time, and under various conditions of load, before the desired results are obtained. Operating under these conditions, it will be well not to allow too much compounding.

The characteristics of the shunt field should be obtained with the compound winding cut out, but the interpole in series. Slowly load the machine as a simple shunt one, noting the effects of the interpole, from no load to full. If sparking results, some adjustment of the interpole shunt may be necessary. If sparking takes place on one or two sets of brushes and not the others, it will be well to see if the brushes are set properly. Sometimes a partly shorted field coil will produce this result also. If sparking takes place on all the brushes, the proper relation should be established with the interpole winding, by an adjustment of the shunt. Also observe closely how well the shunt field holds up the voltage on the different loads, for it will be from this that the strength of the compounding will be determined. When the generator carries its load in this manner without sparking, the compound winding may be added.

In using the compound winding for the first time, it is well to go at it rather cautiously, or, in other words, use a weak compound field, closely following up the observed working of the shunt. The shunt fields of machines operating in parallel with storage cells are maintained somewhat constant by the cells, to a certain extent. Therefore, if a compound is to be worked in parallel, great judgment must be exercised to determine just how much compounding should be allowed, and at which point in the load it is permitted to begin.

A machine having its interpoles adjusted as a shunt generator may have to have them altered slightly when the compounding is cut in. There must be a certain fixed relation existing among the shunt, compound and interpole windings, and when once found, almost perfect results will be obtained in operation. Otherwise seesawing of the load among the different machines may result, often accompanied by flashing, shorting or slopping over.

Scene at Lake Tabeaud, reservoir on the Electra system.

Coast Gas Men to Rally at San Jose

And Boost for the 1915 International Gas Congress

Veritably taking Time by the forelock, the officers of the Pacific Coast Gas Association are calling upon their faithful to make ready for the Association's Annual Convention which is scheduled for September 16, 17 and 18 at San Jose. The following communication has been addressed to all members of the Association by Secretary Henry Bostwick:

San Francisco, Jan. 23, 1913.

Gentlemen: Now that the year 1913 is on its way and at our convention which will be held in the "Garden City" in September, our Association will have attained its majority (this being our twenty-first annual convention), it is incumbent upon us to once more put our shoulders to the wheel with the view of making this convention one that will go down in our annals as a memorable one.

Our Association, upon rounding into its twenty-first year, is confronted with what might be termed its first real responsibility. This statement can be made unequivocally, for the following reasons:

First: We have pledged ourselves to the University of California in an amount not less than $2700 a year (which sum should be materially increased) for the purpose of establishing a Chair of Degree in Gas Engineering, and which sum is to be met by voluntary subscription on the part of the individual members of the Association for a period of five years.

It might be opportune to mention here for the benefit of such members who have not already subscribed to the fund that the subscriptions pledged up to this time range in sums from $5 per year to $100 per year, and if there should be any of our members who have not heretofore subscribed to the fund we take this means of soliciting their support at this time.

In connection with the work, President Wheeler of the University appointed a committee, consisting of Professor C. L. Cory, Professor Robert Sibley and Mr. John A. Britton, and this committee has recommended to the University of California that the subscription for the year 1913 be placed in the hands of the College of Mechanical and Electrical Engineering. Following is the report:

"The undersigned committee, appointed by you to consider the proper utilization of the annual subscription by the Pacific Coast Gas Association of approximately $2700, beg leave to report that for the year 1913 the entire amount of said subscription be placed in the hands of the College of Mechanical and Electrical Engineering for its use in the following manner:

"A—The construction in the Mining Building of a complete crude oil water gas set and all adjuncts, auxiliaries, and accessories.

"B—The purchase of such necessary laboratory supplies and apparatus as may be deemed essential.

"C—The purchase of books on gas manufacture and distribution as are not now in the library of the University of California.

"It is intended that the crude oil water gas set shall be of the laboratory type and sufficient in size to make all experiments for the determination of thermal efficiency of oil and the efficiency of all refractory materials, such as firebrick, entering into the construction of the generators.

"The laboratory apparatus to consist of such adjuncts to present installations in the

University as may be deemed necessary, such as calorimeters and additions to bar photometry installations at present in use.

"It is expected that the Chemistry Department, through Professor Lewis, will co-operate with the Engineering Department not only in such experiments as may be made during the year but in such chemical analyses of gases and materials as would be proper under the course adopted by the faculty.

"It is expected that during the year cooperation of all the gas men on the Pacific Coast will be secured through the efforts of your committee to aid instructors in the Engineering Department in the giving of lectures to the classes interested.

"It is further suggested that in the year 1914 a large proportion of the fund then to be delivered to the University should be used in the employment of competent instructors in the particular line of gas engineering."

The second responsibility which will devolve upon our Association is that of acting as host to the International Gas Congress to be held in San Francisco in 1915.

As you all know, Mr. E. C. Jones, as ex-officio member of our international Gas Congress Committee, was appointed as our special delegate to attend the annual convention of the American Gas Institute for the express purpose of inviting that body to hold its annual meeting of 1915 in San Francisco during the Exposition period, to participate in an International Gas Congress to be held at that time, and to take paternal charge of it and in its name issue invitations to the Gas Associations of the world.

At the annual convention referred to, which was held in Atlantic City in October, it was unanimously voted to accept the invitation, and a working committee was appointed.

The National Commercial Gas Association in convention at Atlanta, Georgia, in December 1912, also voted to hold its annual meeting in San Francisco and participate in the International Gas Congress in 1915.

In this connection, Mr. Jones, acting for the Panama-Pacific International Exposition Company, has issued invitations to twenty-one gas associations in United States and Canada to hold their 1915 conventions in San Francisco and participate in the International Gas Congress. The invitations have been forwarded to the American Gas Institute which, in turn, through its president, Mr. Addicks, will see that they are properly presented before the conventions to be held during the year 1913 by such Associations.

You will see from the above that our Association is intrusted with two matters of extreme importance to our industry as a whole, and in order to bring both of these to a successful and happy conclusion we must have the hearty co-operation of all of our members, for, as has already been said, upon our attaining our majority we at once find a man's job on our hands, and in order that this job may be accomplished with honor to our Association we will need the earnest support of every individual member.

In connection with this our twenty-first convention, we will be glad to receive from any of our members any suggestions which they may have to make regarding the subjects which are to be taken up. We will need papers prepared, and while in the past we have found it necessary to seek out our talent and make special requests for contributions along these lines, we would like to establish a new precedent this year if possible in having all papers to be presented volunteer contributions from our members.

Our slogan from now on will be—"One for all and all for one, the International Gas Congress, 1915."

Yours for the cause,

HENRY BOSTWICK,
Secretary.

P. S.—Our Volume IX of the proceedings will be forwarded to all members about February 1st.

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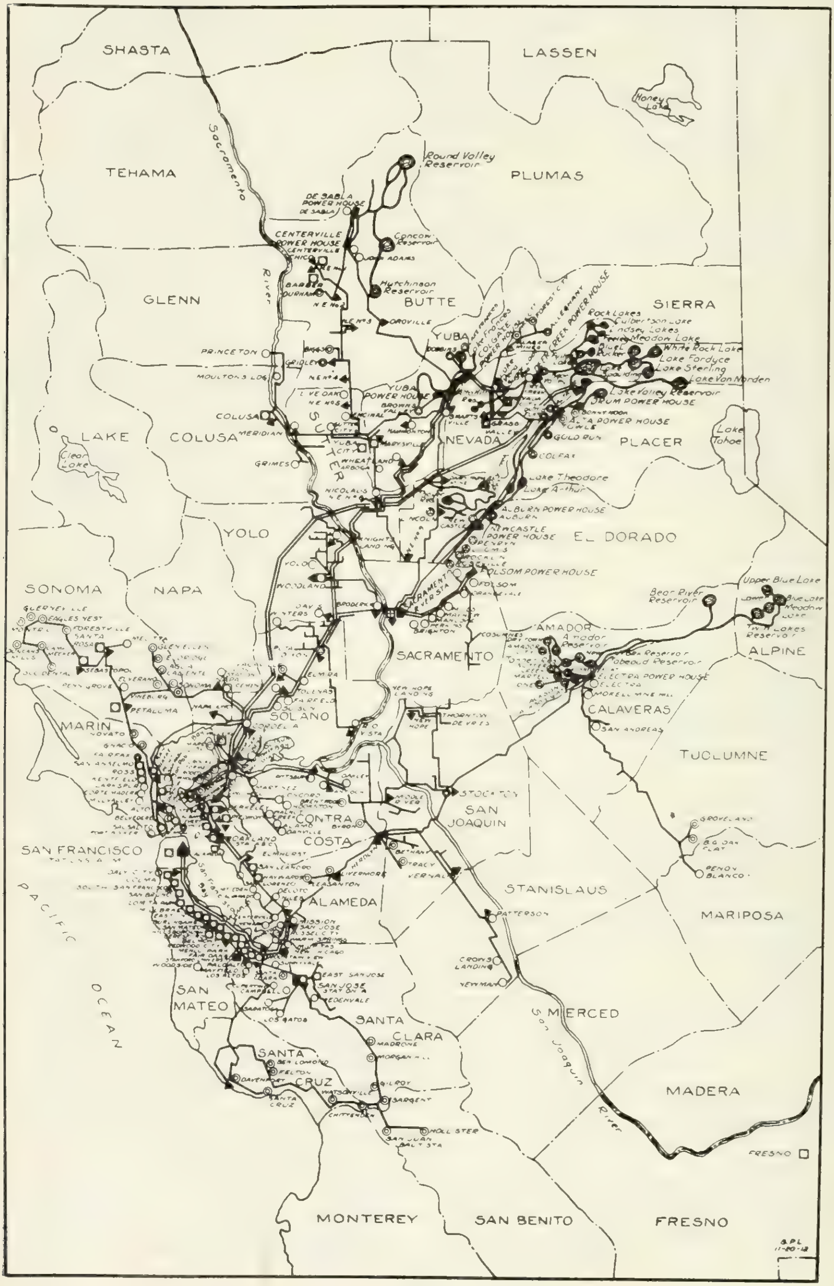
SHASTA
LASSEN
Honey Lake
TEHAMA
Sacramento River
Round Valley Reservoir
PLUMAS
DE SABLA POWER HOUSE
DE SABLA
CENTERVILLE POWER HOUSE
CENTERVILLE
CHICO
Concow Reservoir
Hutchinson Reservoir
GLENN
BARBER
DURHAM
BUTTE
OROVILLE
SIERRA
YUBA
COLGATE POWER HOUSE
Rock Lakes
Culbertson Lake
Lindsey Lakes
Meadow Lake
White Rock Lake
Lake Fordyce
Lake Sterling
Lake Van Norden
Lake Valley Reservoir
DRUM POWER HOUSE
ALTA POWER HOUSE
PRINCETON
GRIDLEY
MOULTONS LDG
LIVE OAK
YUBA POWER HOUSE
COLUSA
MERIDIAN
SUTTER
YUBA CITY
MARYSVILLE
NEVADA
GOLD RUN
PLACER
Lake Tahoe
LAKE
Clear Lake
COLUSA
GRIMES
WHEATLAND
COLFAX
Lake Theodore
Lake Arthur
NICOLAUS
AUBURN POWER HOUSE
AUBURN
YOLO
NEWCASTLE POWER HOUSE
EL DORADO
FOLSOM POWER HOUSE
FOLSOM
YOLO
WOODLAND
SONOMA
NAPA
Bear River Reservoir
Upper Blue Lake
Blue Lake
Meadow Lake
Twin Lakes Reservoir
ALPINE
GUERNEVILLE
SANTA ROSA
SEBASTOPOL
SACRAMENTO
AMADOR
Amador Reservoir
Tabeaud Reservoir
ELECTRA POWER HOUSE
ELECTRA
PETALUMA
SONOMA
MARIN
NOVATO
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CALAVERAS
SAN ANDREAS
TUOLUMNE
PITTSBURG
ANTIOCH
CONCORD
BRENTWOOD
STOCKTON
SAN JOAQUIN
CONTRA COSTA
BYRON
SAN FRANCISCO
OAKLAND
TRACY
LIVERMORE
PLEASANTON
GROVELAND
BIG OAK FLAT
PENON BLANCO
VERNALIS
PACIFIC OCEAN
ALAMEDA
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PATTERSON
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PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[3] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834

Place	Population
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[5] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[5] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300

Place	Population
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

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VOL. 4 MARCH 1913 Nº 10

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Pacific Service Magazine

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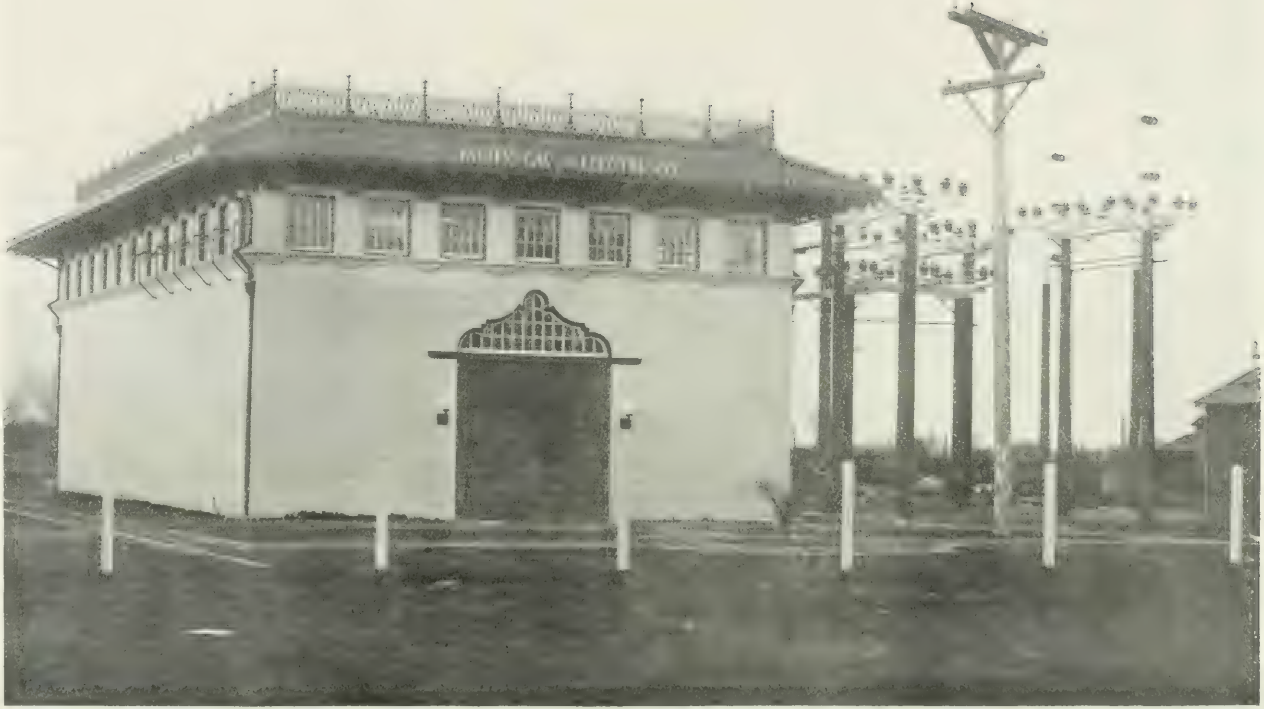


Our new substation at Woodland, regarded as an ornamental feature reflecting credit on the community

PACIFIC SERVICE MAGAZINE

VOL. IV MARCH 1913 No. 10

Our New Substation at Woodland Reflects Credit on "Pacific Service"

By W. E. OSBORN, Manager Woodland District.

W. E. Osborn

In the year 1901 there came to dwell with the Gas Works of Woodland a bright and sprightly youth, overflowing with energy, noted for his cleanly habits and quick to respond to calls early and late. Perhaps it would have been better if these two relatives had occupied habitations further apart, but nevertheless, that lusty youth, known as the Woodland electric substation, managed to hold its own for a full decade.

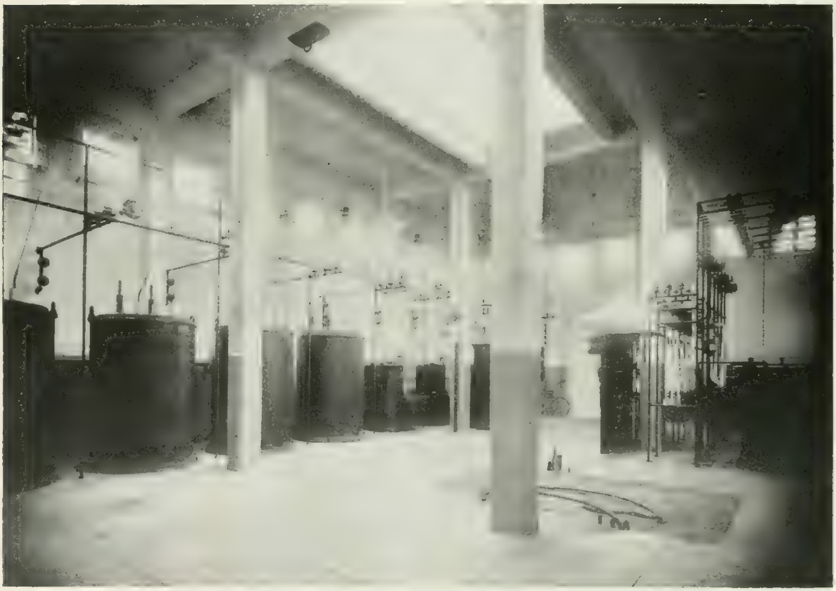
And now Woodland again takes on new life and activity. Expansion is the watchword and, with the advent of the electric road from Sacramento, a new home for our sprightly youth became imperative. In the year 1910, Mr. John A. Britton paid Woodland a visit of inspection; as soon as he saw the narrow confines of the Gas Works and the Substation his practical eye told him that a new home must be obtained for these two growing departments where they could expand and not be hampered one by the other. And so it comes to pass that Woodland has a new electric substation, architecturally handsome and perfect in its up-to-date equipment.

A new site was purchased containing three and a half acres of the best land in Yolo County, located just without the city limits. It was not deemed expedient to build the new substation until the plans of developing and constructing the Sacramento and Woodland Railroad had so far matured that a new structure was an absolute necessity. However, the Electric Road, though a great factor in securing for Yolo County the new home for distributing electric energy, is by no means the main factor. The City of Woodland surrounded as it is by some of the richest land in all California, has grown from a town of less than 4,000 inhabitants in 1910 to one of 5,000 inhabitants in 1913. The call for electric power and lighting has taxed the Company's resources to keep pace with the demand.

Turning again to the country, the demand for electric energy has grown so fast that it seems almost marvelous. In the year 1910 there were only five horsepower in motors driving irrigating pumps; today there are in both irrigating and reclamation work not less than 2,500 horsepower ready at a moment's notice to respond, through the Woodland substation, to the demands of the farmer.

Last, but not least, in the homes, in the stores, in fact in any of the walks of life, either in a social or business way, there is an increased demand for electric current.

Our lines extend first to Woodland, then to the west to Madison, on the south to Willow Slough on the way to Plainfield; on the north they extend to Knight's Landing and still farther on to the Colusa County line; to the northwest to and beyond the town of Yolo, and to the east to Elkhorn and the Sacramento River.



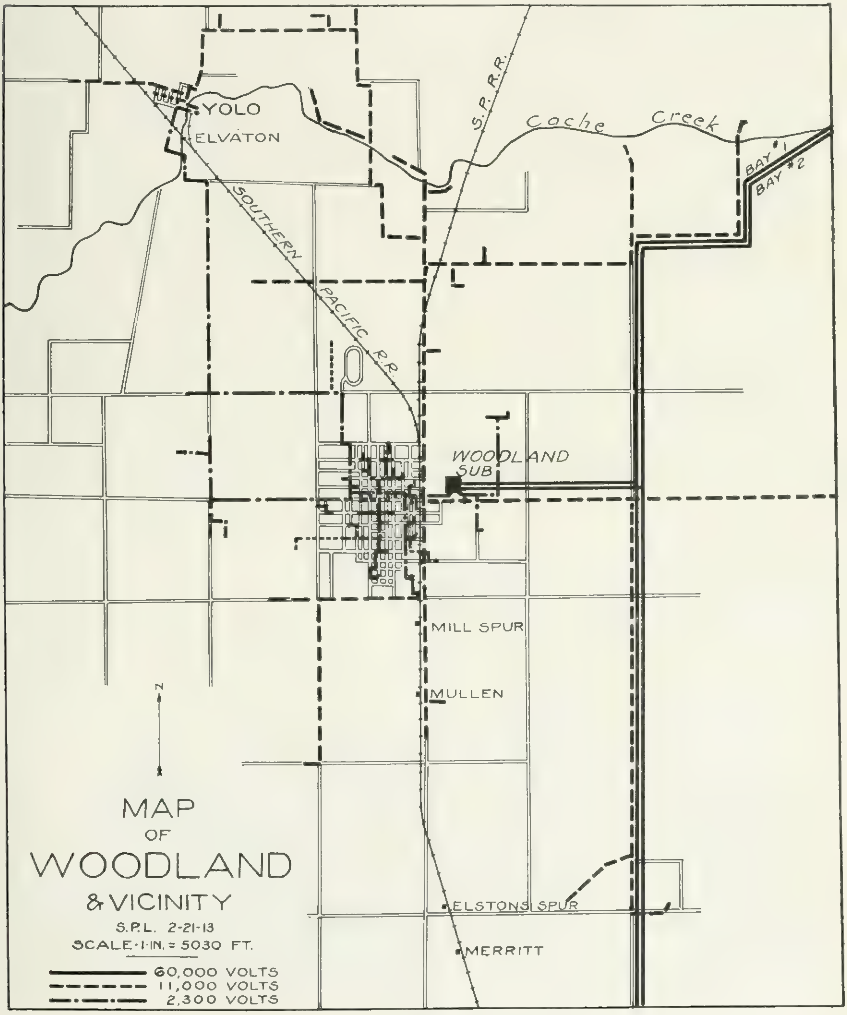
Interior of Woodland substation, showing transformers

The Bay 60 K. V. transmission lines, which cross the Sacramento River at Vernon on the way to the Bay Counties, pass to the east of Woodland about two miles. Taps from both Bay lines No. 1 and No. 2 are run to the Woodland substation on a two-circuit wooden pole line. These tap lines are carried on suspension insulators and are supported vertically one line on either side of the pole. Switches are provided at each end of the lines to permit the usual maintenance. At the substation the flexibility is such that either line may be opened without interrupting the service from Woodland. There is also an 11 K. V. tie line between Woodland Substation and Knight's Landing Substation permitting either station to carry the other's load at will.

On June 21st, 1912, ground was first broken for the new re-inforced concrete home of light and power now known as "Pacific Service." The architectural design is of the Spanish Renaissance, verging on the Mission type, and is most striking in appearance, being unlike anything to be seen in Yolo County.

As to the size of the new Substation and the equipment upon its floor, it is in marked contrast to the old Substation, formerly located at the Gas Works on the corner of Fourth and Main Streets. The floor space is 36 ft. 3 in. by 64 ft. 4 in. The mean height of the ceiling is 23 feet. The walls, reinforced with steel bars, are only 6 inches thick. The ceiling, as well, is also re-inforced concrete and is supported by four re-inforced pillars. In the ceiling are two iron eye bolts for attaching chain blocks and each eye bolt is capable of sustaining a weight of 15,000 lbs. The ceiling between the four pillars is surmounted by a sky-light in size about 15 x 8 feet. Ranging around the top of the wall are thirty-eight six-pane windows, thus, with the sky-light, giving ample light and ventilation.

From without the cornice is of Mission type with red and green trimmings, which with the red tilings, contrast strikingly with the cream tinted walls. Along the top of the cornice are thirty-eight pilasters, each surmounted by a round, opal globe containing a 40-Watt Mazda lamp which, at night time particularly, punctuates "Pacific Service." Between and joined to each pilaster is an iron balustrade adding to the beauty of the building's crown.



The apparatus installed in this station consists of a bank of 3, 750-K. V. A. transformers stepping down from 60 K. V. to 11 K. V. supplying the Knight's Landing and Elkhorn lines. A spare transformer is also provided for this bank.

A bank of 3, 250-K. V. A. transformers stepping down from 60 K. V. to 2,300 volts supplying the town of Woodland and vicinity and the railway motor generator set.

A 400 K. W. direct connected motor generator set consisting of 580 H. P., 2,300 volt, 3-phase induction motor and 400 K. W. 600-volt D. C. generator, supply power to the railroad.

A 3-phase, 50 K. W. automatic regulator is installed to regulate the voltage on the 2,300 volt service.

Concrete switch compartments are provided for the 11 K. V. oil and disconnecting switches, the oil switches being automatic. The 2,300 volt switches are mounted directly back of their respective switchboard panels the buses being carried on pipe frame work. Two arc tubs are installed, one of 25-light and one of 50-light capacity. The switchboard comprises 10 ebony asbestos panels with the necessary instruments and switch levers. Cooling water for the transformers is pumped from a well near the station by a direct connected centrifugal pump.

Through the center, suspended in four clusters, are 16 40-watt Mazda lamps, while there are twelve wall sockets for any additional lights that may be required.

The building was finished and all equipment installed and put into operation on the last day of December, 1912, with the exception of the motor generator for the railway service which was put into operation on February 21st, 1913.

The far reaching possibilities of the amount of business gained, the varied interests to be affected by the distribution of electric energy through the Woodland substation, interests that demand constant service and that affect the life and happiness of a growing population are too numerous to be enumerated in this short article.

In conclusion let me say that when the finishing touches are completed, and the landscape gardener has laid out the grounds, the Woodland substation will be a landmark of which all Yolo should be proud; and "Pacific Service" should receive its merited reward as a promoter of up-to-date enterprise.

* * *

The Watchword is—Loyalty!

"If you work for a man, in Heaven's name WORK FOR HIM. If he pays you wages that supply your bread and butter, work for him; speak well of him; stand by him and stand by the institution he represents. If put to a pinch, AN OUNCE OF LOYALTY is worth a pound of cleverness. If you must vilify, condemn and eternally disparage, why, resign your position and, if you are a weakling, when you are outside damn to your heart's content. But as long as you are a part of the institution, do not condemn it. If you do, you are loosening the tendrils that hold you to the institution, and the first high wind that comes along, you will be uprooted and blown away, and probably you will never know why, as many have experienced."

The New Woodland 60 K. V. Loop

By WILL T. JONES, O. & M. Department.

Will T. Jones

During the past year the demand for electric power for various purposes has been tremendous, especially in those localities where it has been proven that the "motor" driven pump for irrigating purposes is not only economical but reliable and convenient. It is in demand also in the territory that is being rapidly covered with electric railroads.

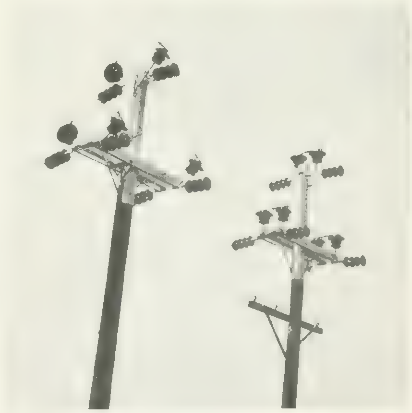
There is probably no county in the State where the demand for electric service has been greater during the past year than "Yolo County," especially in the vicinity of Woodland. To meet this increasing demand and to insure more perfect service it has been found necessary to replace the present substation in the town of Woodland with a new building equipped with all modern appliances in the way of transformers, motor generator sets, voltage regulators, switchboards and control, etc., and to replace the present 60 K. V. line leading from bay lines No. 1 and No. 2, to the old substation with a new line from the bay lines to the new substation.

It is of the construction of this new line that this article treats. During the past five years considerable progress has been made in improving the construction of pole lines as well as other branches of the electrical field. The suspension insulator has wrought a great many changes in the method of attaching wires to the poles and crossarms, and it seems as if this type of insulator were destined to supplant the pin type entirely at some future date in the construction of all pole and tower lines carrying a high voltage.

The suspension insulator allows a great deal more flexibility in a line, as well as a greater electric factor of safety and these facts, the writer believes, will have a tendency to reduce the number of disturbances and shut-downs, thus improving conditions and tending to reach that goal so much desired by power companies and consumers, alike, "Perfect Service."

When the time came to replace the old Woodland, 60 K. V. loop with a new line it was decided by the engineers of this department to put both tap lines on a single line of poles arranging the conductors symmetrically in vertical planes on each side of the

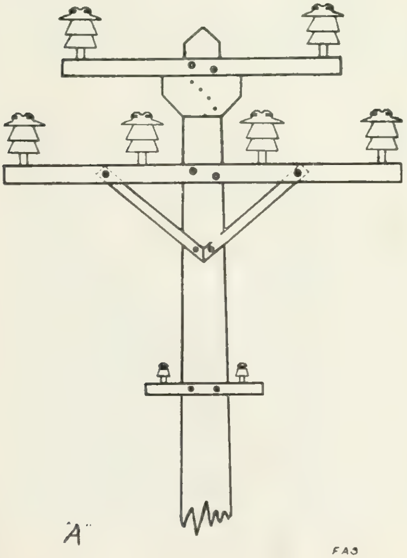
Raising the 60 ft. poles

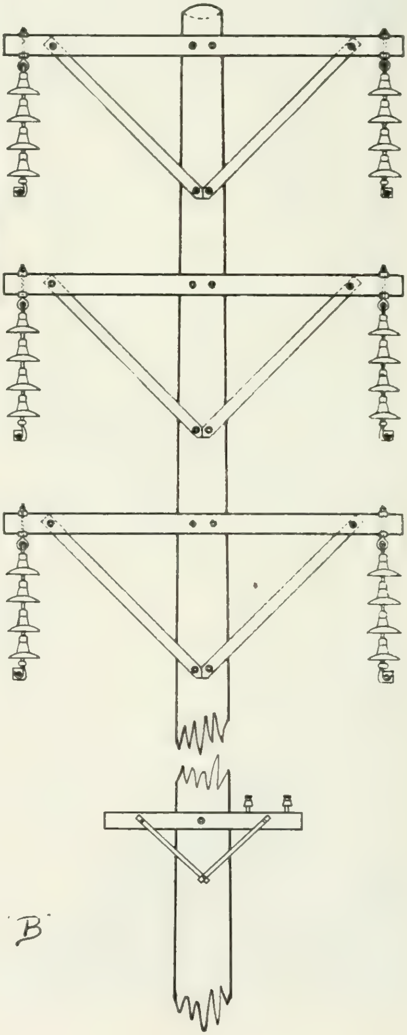


The Downing disconnecting switches

Woodland 60 K. V. Loop

poles. The diagram marked "A" shows the type of construction used on the old line, and the one marked "B" shows that used on the new line. On this new piece of line 60 ft. round cedar poles were used, spaced 20 to the mile, and the crossarms were constructed of clear Oregon pine, 6″ x 6″ x 10′ long. Each crossarm was fitted at the top and, also, at the bottom with a small galvanized iron plate $\frac{1}{4}$″ thick by 6″ wide through which passed an eyebolt to which was attached four suspension insulator units. The





small galvanized plates used gave more bearing surface for the eyebolts, and on account of the ends being turned will have a tendency to prevent the arms from splitting. Wooden quarter braces 2″ x 3″ x 5′ 6″ were used. These were bolted to the crossarms and fastened to the poles with lag screws. The conductor used on this line was medium hard drawn copper.

At the junction of this line with the bay lines there is installed on each circuit one of the new vertical break 60 K. V. disconnecting switches known as the "Downing type." This switch represents the latest development in outdoor disconnecting switches, and by referring to picture shown herewith, you will note that the switch is mounted on one pole, thereby demonstrating its economy over the old two pole structure. The picture shows one switch open and the other closed and gives a good idea of their simplicity of operation.

Thus it will be seen that this line has been built on principles entirely different from those used on other portions of the vast system covered by this company, and the successful operation of this section of line will be closely watched by all interested parties. The writer is indebted to Mr. Baloun, chief draftsman, for the sketches and to Mr. W. D. Skinner of the Load-Dispatcher's office and Mr. Osborn of Woodland, for the pictures.

* * *

Panama-Pacific Exposition to be Equipped With "Pacific Service"

Exclusive contracts for electric light and power, gas and steam awarded to the Pacific Gas and Electric Company. A big undertaking for both parties to the bargain.

Just as this issue of Pacific Service Magazine goes to the printer we receive news that the directors of the Panama-Pacific Exposition have awarded to our company exclusive contracts for the supplying of electricity for light and power, gas for illumination and steam for heating purposes, to run from the present time through the construction period, during the life of the Exposition and until this great international celebration shall be a thing of the past and the work of dismantling accomplished.

We shall have more to say on this subject in a later issue. It is a big thing, of course, and one of which "Pacific Service" feels justly proud. We may safely say that none but an organization of the magnitude and scope of ours could enter into an undertaking which involves large expenditures in the way of extensions and improvements and whose period of usefulness, so far as the Exposition is concerned, will be of but brief duration.

The Manufacture of Coal Gas

A Lecture Delivered at the University of California

By E. C. JONES

E. C. Jones

THE choice of materials for making gas is nearly always influenced by local conditions, and these conditions are seldom permanent.

In the beginning of the gas business resin was distilled in iron retorts, and resin gas was sold in some of the eastern cities of this country. While in England oil gas was made in many of the cities and towns, using oil costing £19 the ton, but owing to the excessive cost of all other materials, the manufacture of gas settled down to the use of coal as the substance best suited for gas-making by reason of its generous distribution, plentiful supply, and moderate cost.

Each locality selected the coal nearest at hand or to be obtained at the lowest price. England used the coal from Newcastle, while Scotland made gas from the more volatile cannel coals. The New England and Middle States of our own country used the coals of Prince Edwards Island and Nova Scotia and domestic coal mined in Pennsylvania and West Virginia. California obtained bituminous coal and rich shale for gas-making from Australia, depending upon return cargoes of wheat to attract the carriers, and finally resorted to the use of somewhat inferior coals from Vancouver Island and the State of Washington.

Coal was used almost exclusively for gas-making until the introduction of water gas in the early seventies, when the production of petroleum and its distillates made it economically possible to substitute water gas in whole, or in part, for coal gas in nearly all the cities of this country, within a reasonable distance of the oil supply.

The use of water gas also extended to European cities as an auxiliary to coal gas, and the discovery of oil in California made it possible to manufacture water gas in small quantities for enriching coal gas. As the oil supply increased and the price diminished, coal gas was entirely displaced by water gas in all the larger places in California, until the advent of crude oil gas which now occupies the field alone.

The coal gas industry advanced from iron to clay retorts; from ordinary furnaces for heating to the most improved regenerative and recuperative system; from horizontal to inclined, and then to vertical retorts, and the treatment of masses of coal in the modern coke oven plants. The coal gas works is not so attractive nor is it so simple in its operation as the oil gas works of California. The manufacture, handling and marketing of the by-products is complicated and cumbersome; but in spite of all this the manufacture of coal gas has steadily grown in every part of the world, excepting California and a few places that share its abundant supply of oil.

The present upward tendency of the price of oil in the Eastern and middle parts of the United States is discouraging the manufacture of water gas, and in some places making its use prohibitive. These economic changes have stimulated invention and improvement in the art of making gas from coal, and the disposal of its by-product; so that as the cycle proceeds, coal gas will become independent of the use of oil.

In twenty years, gas making in California has changed from all coal gas to a mixture of coal and water gas; then to water gas; and now to all oil gas, and each successive stage resulted in the almost complete obsolescence of the previous gas-making apparatus.

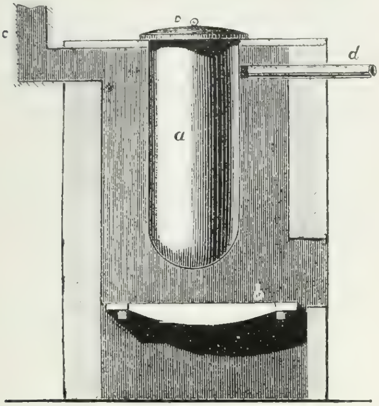


Fig. 1

It would be disloyal to even hint at the possible failure of the California oil fields, with their 87,000,000 barrels output in 1912; yet one is privileged to wonder what the next phase of gas-making will be in California. This is simply clearing away some of the rubbish in getting ready for the foundation on which to build a sound understanding of the gas business. Gas Engineering demands versatility of knowledge and effort. One does not want to be a Maine nor a California gas engineer; neither does one want to be known as an oil-gas, coal-gas, nor water-gas engineer; and so, regardless of the temptation to bask in the sunshine of California's liberal blessings, and use its bounty to make gas in a convenient and economical way, the gas engineer must understand every phase of the business, in order that he may feel that he has a vocation that will make him a welcome and well-paid addition to any community where gas is made.

Coal gas is a product of the destructive distillation of bituminous coal, a type of coal containing a large amount of volatile matter and at the same time a proper proportion of fixed carbon to give it coking qualities. These coals used for gas-making are known as caking coals.

To illustrate the difference between a typical caking coal and the anthracite, or non-caking coal of Pennsylvania, the following analyses are given:

	Moisute	Volatile Matter	Fixed Carbon	Ash	Sulphur
Bituminous Coal (Tennessee) . . .	1.50	32.51	59.33	5.82	.84
Anthracite Coal (Pennsylvania) .	2.98	3.38	87.13	5.86	.65

The first retorts used for distilling coal were made of iron, and were set in furnaces, afterwards known as benches, in settings of one retort to a bench.

Four progressive types of retorts are described by Clegg.

Fig. 1, a vertical chamber with the gas outlet at the top of the side. On account of the difficulty of removing the coke from the retort this form soon developed into Fig. 2, the horizontal retort, and later to Fig. 3, a larger vertical retort with a top opening for charging coal, and a side outlet at the bottom for drawing coke. Further improvements resulted in the use of Fig. 4, an inclined retort with gas outlet and charging door at the top, and a drawing door for coke at the bottom. Finally the horizontal retort shown in Fig. 2 was again adopted. This retort was D shaped, instead of round as shown in Fig. 2 and was provided with a mouthpiece and stand-pipe at the front end. This shape and horizontal position simplified the charging of coal and drawing of coke, while the mouthpiece was at a convenient height to apply the clay-luted lid for hermetically sealing the retort during the period of distillation.

These iron retorts were set in benches containing from one to five retorts each, and the benches were heated by a simple furnace, using the coke from the retorts as fuel. After heating the retort to a cherry red and maintaining this heat, a charge of from one hundred and fifty to two hundred pounds of coal was spread evenly over the bottom of the retort, and the mouthpiece was sealed by putting on a lid. Distillation began at once, and the products, consisting of gas, and tar in the form of vapor, together with the impurities—consisting of water vapor, ammonia, and sulphur compounds—escaped from the retort through the stand-pipe; thence through a bridge pipe and dip pipe into the hydraulic main.

The hydraulic main rests horizontally on the top of the bench, or benches, and serves a double purpose of conducting the gas, and providing a hydraulic seal, or valve, to prevent the return of the gas into the stand-pipe and retort.

The dip pipe is so-called because it connects the bridge pipe to the hydraulic main, and extends downward into the main, dipping its end into the tar and ammoniacal liquor, which condenses in the main. The overflow from the hydraulic main for liquids is adjustable for height, so that the desired seal of the dip pipe is maintained.

The gas passing downward through the dip pipe bubbles through the liquid, and rising above it, passes along the hydraulic main to its gas outlet. Five hours was the usual length of time the coal was allowed to remain in the retort. The retort lid was then removed, and the hot coke was drawn out of the retort by means of an iron rake into an iron barrow. This barrow was then wheeled into the yard and dumped. The hot coke was then quenched, or "drowned," by throwing water on it from buckets. As the work increased the quenching of coke was done by means of a hose, but this was to the detriment of the coke.

The temperature of the retorts was roughly estimated by the use of the following table, giving colors corresponding to temperatures Fahrenheit.

980°	Fah.	Faint red, seen in daylight.
1290°	"	Dull red, color of red oxide of iron.
1470°	"	Bright red, color of red oxide of lead.
1650°	"	Cherry red.
1830°	"	Bright cherry red.
2010°	"	Dull orange.
2190°	"	Bright orange.

These comparisons are interesting, but are perhaps confusing in a country where cherries range in colors from white to black.

While using iron retorts its was necessary to distill coal at comparatively low temperatures on account of the danger of destroying the retorts by melting. (Cast iron melts at 2,786° Fah.) The yield of gas was small, while the amount of tar of excellent quality was large, and the coke was soft and of a dull black color.

Experimenters realized that distillation at higher temperatures would produce more gas by converting the light volatile portions, of what was then tar, into gas, besides further driving the volatile matter from the coke, thus producing more gas and improving the quality of the coke.

This practically forced the adoption of clay retorts, which were first made in Scotland earlier than 1820, and D shaped and oval shaped retorts were made in 1834.

It was not until 1844 that the chartered Company of London decided to use clay retorts. This was the first practical use of them in England, and it was many years later that they displaced iron retorts in this country.

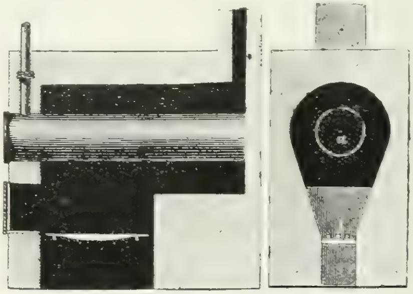


Fig. 2

When viewed in the light of present knowledge, it is easy to criticize and blame the pioneers of the gas business for not immediately availing themselves of new and better ways of doing things, but it would be like censuring Moses for taking forty years to travel over a road which can now be covered in a few hours in a modern automobile.

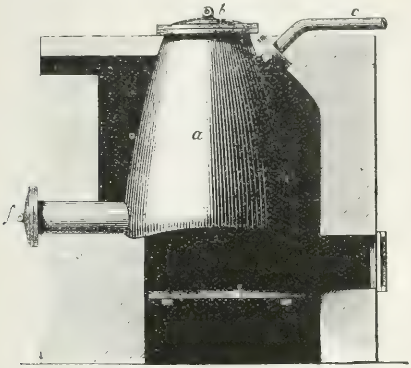


Fig. 3

Iron retorts had a life in service of only twelve months, and it was known that a clay retort would last thirty working months, but iron retorts were gas tight, and clay retorts were porous and leaked gas into the furnace. There was a heavy back pressure on the retorts, due to the gas forcing its own way out of the retorts and breaking the seal in the hydraulic main. This necessity caused the invention of the gas exhauster, a rotary pump connected to the outlet of the hydraulic main and operated for the purpose of quickly drawing away the gas from the retort as soon as it was generated, and reducing the pressure within the retort to nearly that of the atmosphere. This, together with a newly discovered method of salt glazing the inside surfaces of clay retorts, effectually stopped the leakage of gas and removed the most serious objection to the use of them.

There was one objection not so easily overcome—iron retorts might be heated and cooled again at will, but the clay retorts, while capable of withstanding much higher temperatures, required more careful handling. It was necessary to steadily apply the heat and maintain a nearly uniform temperature, and the best results were obtained by keeping clay retorts in service, under fire, until their life's work was done. Firing up and letting down benches of clay retorts caused cracks and distortions which materially shortened their time of usefulness. Back pressure of gas on the retorts caused deposits of particles of free carbon on the interior of the retorts. (This was also known as graphite or retort carbon.)

This carbon accumulated in such quantities that it seriously retarded the passage of heat to the coal, and it became necessary to loosen the carbon by blowing a jet of steam and air into the retort while it was out of service. This process is called "scurfing," and it burned away enough of the carbon at its point of contact with the retort to permit of its removal by iron chisel bars. The gas exhauster did not entirely cure this evil, but it greatly reduced the amount of carbon deposited in the retorts. This substance whose origin is traceable to the decomposition of certain hydro-carbons in the gas, was for a long time used for making battery plates; and is so nearly pure carbon that it is the closest, although a somewhat shabby, relation of the diamond.

To avoid the back pressure in the retort, due to the seal of the dip pipe, a by-pass containing a quick opening valve was used to convey the gas directly from the dip pipe into the top of the hydraulic main, thus by-passing the seal, and at the same time retaining the dip pipe as a safeguard against accidents due to neglect in opening the valve while the retort was in operation. This ingenious device still further reduced the deposit of carbon in the retorts, and increased the yield of gas from the coal. The quantity of gas yielded by the carbonization of bituminous coal is almost directly proportional to the heat applied to the retort.

If coal is distilled at a temperature of 600° Fah. (which is the lowest temperature visible in a completely darkened room), the volatile matter in the coal is nearly all converted into liquid tar, oil, and water, with a small yield of gas. The remaining coke is soft, and of a dull black color. Paraffin oil was formerly made by treating cannel coal and shale in this way, and within the last few years extensive enterprises have been established in England for distilling coal at low temperatures, (in the neighborhood of 800° Fah.), for the production of soft coke known as "Coalite" for use as domestic fuel, the partial abatement of the smoke nuisance in London, and the recovery of a considerable amount of illuminating gas as a by-product.

At 980° Fah. coal yields about 6,000 cubic feet of gas to the ton, and at 1,400° Fah. about 8,000 cubic feet. This temperature was considered a safe heat for iron retorts, and after the introduction of clay retorts it was found that a temperature of 2,010° Fah. (dull orange) was best suited for carbonizing coal and the yield per ton was increased to 10,500 cubic feet. Coal distilled at this temperature yielded gas and coke of good quality. Subsequent improvements in furnace construction increased the heat of the retorts to above the melting point of cast iron, with a considerable increase in the yield of gas, and an improvement in the quality of the coke; but the gas was of poorer quality, requiring extra enriching to raise it to a satisfactory candle power, and the tar was impoverished by being robbed of its lighter oils. This stage of the gas business might be called the "Nativity of Naphthalene" ($C_{10}H_8$) that bete noir of the gasman's existence. It had formerly slept peacefully in the rich coal tar of low temperature distillation, but was awakened by the greedy gas man to appear before him as vapor, liquid, or crystal, as its moods decreed.

The rate of generation of gas from coal yielding 10,500 cubic feet to the ton and remaining in the retorts during a period of four hours, is about as follows:

First	hour	of	carbonization	yields	3300	cubic	feet.
Second	"	"	"	"	2930	"	"
Third	"	"	"	"	2650	"	"
Fourth	"	"	"	"	1650	"	"

Iron retorts were set in simple furnaces using coke as fuel. The coke was burned on grate bars at the bottom of the furnace, and the products of combustion passed out through a flue at the back and directly under the arch. Little heed was given to economy of fuel, in fact, the hot coke was drawn from the retorts, wheeled into the yard and quenched with water, and then hauled back into the retort house and used for fuel, water and all.

In some small works all the coke made was used to fire the benches, and in the best of the larger ones one-half of the coke was used.

Clay retorts and higher temperatures required careful study of the principles of combustion and the application of heat to perform work. This lead to increasing the number of retorts in a settling to five, then six, and finally to as many as eight and nine. It began to be recognized that higher heats might be obtained by the use of less fuel, and the remaining coke might be sold as a valuable by-product for domestic use as fuel.

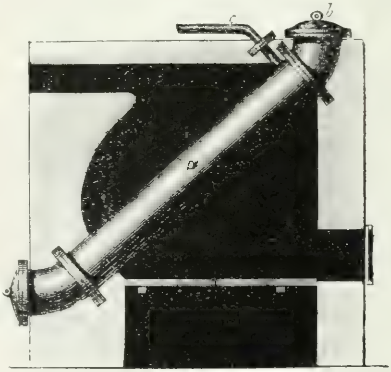


Fig. 4

The first improvement in furnaces was made by lengthening the time of passage of the hot gases, from the fuel bed to the chimney, by constructing horizontal flues at the bottom of the bench, on each side parallel to and under the bottom retorts. In this form of bench the products of combustion rise from the fuel bed to the arch and then pass downward, entering the flues at the front and pass under the bottom retorts, through vertical flues at the back of the bench. Further improvements in furnace construction included the adding of more flues for absorbing and transmitting heat, and each development resulted in economy of fuel.

Soon after the invention of the Siemen's producer this system was applied to regenerative bench heating. The term "regenerative" means the conversion of the fuel into gas, and the burning of this gas to heat the retorts. Many forms of this furnace have been built, some of them consist of a deepening of the furnace in order to get sufficient depth of fuel to generate gas, and others use an independent producer at the front or back of the benches for firing one or more benches. Producer gas made from coke in this manner has about the following analysis:

Carbon monoxide	29.0%
Carbon dioxide	4.0%
Hydrogen	2.5%
Nitrogen	64.5%
	100.00%

This gas is of low calorific value, a cubic foot giving only about 72 B. T. U. The use of this gas resulted in marked economy of fuel, but to obtain the best results it was found necessary to heat the air used for combustion. This is called recuperation. The air was heated by interposing a series of air flues between, but separate from, the outgoing waste gas flues in the benches. In the first recuperative furnaces, the primary air was heated as well as the secondary air—primary air is the air which unites with the coke to form producer gas; secondary air is the air used for burning the producer gas—but it was soon discovered that there was no economy in heating primary air, but that to obtain high temperatures from producer gas of low heating value it was necessary that the secondary air used for the combustion of the gas should be heated to a high temperature. These refinements in furnace building resulted in a saving of about one-third of the fuel over direct firing of coke, and a better distribution of the heat.

Benches have been heated by this method with as little as 16% of the coke produced.

The next step in the progress of coal gas making was an effort to reduce the labor of charging coal and discharging coke in the operation of stop-end horizontal retorts.

Benches were built in stacks placed back to back and "through" retorts fifteen feet long were used. This form of retort has some advantage in increasing the yield of gas, and it is easy to operate a mechanical pusher for discharging coke.

One of the most recent and best equipped installations of this type of bench is at Worcester, Mass., and the following comparison of results shows the economies gained.

Original benches, horizontal stop-end retorts 16" x 26" x 10 ft. 4.95 cubic feet of gas per pound of coal. Candle power of gas 14 candles. Candle feet obtained per pound of coal 70. New through horizontal retorts, 8 retorts (16" x 26" x 15 ft.) to the bench. 5.95 cubic feet of gas per pound of coal. Candle power of gas 17 candles. Candle feet obtained per pound of coal 101. Make of gas per bench in twenty-four hours (seven hour charges) 150,000 cubic feet. Coke used for fuel 15.3 pounds of hot coke per 100 pounds of coal carbonized.

The term candle-foot was a necessary outgrowth of the use of high temperatures to increase the quantity of gas made at the expense of its candle power; and it was found that a simple statement of gas made without a knowledge of the candle power of the gas was misleading, and often caused unwarranted criticism of investigators, but the coupling of quantity and quality in a single term permits the comparison of large yields of low candle power gas, with moderate yields of high candle power gas without prejudice. Candle feet means the yield of gas per pound of coke in feet, multiplied by the average candle power of the gas.

In Europe and in this country many benches of inclined retorts have been used with much success, and as Murdoch progressed, from vertical retorts to inclines and then to horizontals, his successors have gone back over the cycle through horizontal and inclines until at last the vertical clay retort has come into use in some of the most recent large installations. These are of two classes, the intermittent charging and drawing kind as at Manchester, N. H., where there are benches of nine vertical retorts each. These retorts are 10″ by 14″ at the top, and are 15″ x 21″ at the bottom. They are made larger at the bottom to facilitate discharging the coke. The vertical retorts are 18 ft. 6 in. long.

The most recent development in the use of vertical retorts is a system of continuous charging and drawing in small quantities; this it is claimed has the advantage of not overheating the gas and destroying the candle power, and there is less deposit of carbon in the retorts.

Dr. Bueb gives the following figures showing the heating value of gas made from the same coal by the different methods.

Vertical	retorts	604 B. T. U's. per cubic foot.
Inclined	retorts	584 B. T. U's. per cubic foot.
Horizontal	retorts	570 B. T. U's. per cubic foot.

This lecture is limited to a somewhat sketchy description of the manufacture of coal gas, and the delivery of it into the hydraulic main, but before leaving the subject it is necessary to have an intimate acquaintance with the coal and what happens to it in the retort. There is no better way to do this than to follow the carbonizing of a ton of coal and analyze the products by weight. The following are the results of the writer's experiments with average bituminous coal, carbonized in horizontal clay retorts.

A TON OF COAL (2,240 lbs.)

Gas	387.12	Pounds
Coke	1,509.00	"
Tar	139.34	"
Amonniacal Liquor	153.00	"
Loss	51.54	"
	2,240.00	"

GAS

(387.12 lbs.)

The weight of gas includes the whole amount of carbonic acid, sulphuretted hydrogen and ammonia, and is the weight of the gas at the outlet of the hydraulic main. The yield of gas per ton of coal was 10,500 cubic feet, and the analysis that follows is an average of a number of samples of finished coal gas, unenriched, to which is added the amount of carbonic acid, sulphuretted hydrogen, and ammonia, found in gas taken from the hydraulic main.

Illuminants—C^nH^{2n}	46.599	Pounds
Marsh Gas—CH^4	177.282	"
Hydrogen—H^2	27.951	"
Carbon monoxide—CO	56.826	"
Nitrogen—N^2	14.154	"
Oxygen—O^2	1.312	"
Carbonic dioxide—CO^2	47.880	"
Sulphuretted hydrogen—H^2S	10.605	"
Ammonia—NH^3	4.515	"
	387.124	"

The washers and lime purifiers removed:

Carbon dioxide—CO^2	45.937	Pounds
Sulphuretted hydrogen—H^2S	10.605	"
Ammonia—NH^3	4.515	"
	61.057	"

The crude gas corrected to 60° Fah. had a volume of 11,086 cubic feet per ton, which was reduced by washing and purifying to

10,500 cu. ft. The analysis of the finished gas by volume was:

Illuminants C^nH^{2n}	5.68	per cent.
Marsh Gas CH^4	37.80	"
Hydrogen H^2	47.58	"
Carbon monoxide CO	6.93	"
Nitrogen N^2	1.72	"
Oxygen O^2	.14	"
Carbon dioxide CO^2	.15	"
	100.00	"

and weighed 31.053 lbs. per 1000 cubic feet.

COKE.

(1509 lbs.)

This coke was obtained by experiments with standard Pennsylvania and Westmoreland coals. In each experiment four-tenths of a ton was charged into an isolated bench of retorts, at a good heat, and at the end of four hours the hot coke was drawn into an iron barrow and weighed. After quenching, the coke was measured in a steel bushel, (2747.7 cu. in.). The average weight per bushel of hot coke was 35.5 pounds, and the yield per ton was 1509.68 pounds, giving an average yield of quenched coke of 42.5 bushels per ton of coal carbonized.

The analysis by weight of the above amount of coke is:

Carbon	1,349	Pounds
Ash	160	"
	1,509	"

The ash consisted by weight of about the following:

Silica	95.3	Pounds
Alumnia	19.5	"
Iron peroxide	25.6	"
Lime	16.0	"
Magnesia	1.8	"
Potash	1.8	"
Ash	160.0	"

TAR.

(139.34 lbs.)

This included all the tar collected from the hydraulic mains; exhauster, condensers, washers, and center seal. The average yield was 14.1 gallons per ton of coal carbonized and its weight was 9,882 pounds per gallon.

Coal tar yields by distillation:

Benzole (inc. toluene, etc.)	1.11	Pounds
Other white oils	.84	"
Crystallized carbolic acid	.28	"
Cresol	.42	"
Naphthalene	5.15	"
Cresote Oil	33.44	"
Anthracene (pure)	.28	"
Pitch	76.64	"
Water and loss	21.18	"
Coal Tar	139.34	"

AMMONIACAL LIQUOR

(153 lbs.)

The amount of ammoniacal liquor produced directly from coal varies from 60 pounds from cannel to 212.8 pounds from a mixture of equal parts of cannel and bituminous coal. 153 pounds is an estimate based on experiments with different coals, and may be taken as a fair average. These results show that the loss in distillation amounted to only 2.3%.

The coking of coal in masses began with the beehive oven, which takes its name from its shape. The first beehive oven used all the gas produced as fuel, and no attempt was made to recover tar and ammonia. From this beginning has grown the present retort form of oven, with improved furnaces, and the use of regenerators for economizing fuel. Labor costs are reduced by the use of coal handling machinery and mechanical devices for charging and drawing. The Semet-Solway and Otto-Hoffmann ovens are most generally used in this country and it is interesting to note the scope of the work performed by these ovens. Some are supplying cities with illuminating gas and furnishing coke to steam railroads as smokeless boiler fuel, and at the same time recovering and refining the tar and ammonia, other ovens are mainly used for producing tar and ammonia and their derivatives, while coke and gas though valuable are considered as by-products. At the

Everett Plant of the New England Gas and Coke Company the Otto-Hoffmann ovens are used, and the surplus gas is distributed in Boston. The coke which is the result of carbonizing the coal for thirty hours has a ready market. At this plant slack coal from the mines of Nova Scotia is used. This coal is of inferior quality and is high in sulphur content. The excess of salable gas from Otto-Hoffmann ovens is about 40% of the total yield of gas.

Gas making by this method is best suited to centers of dense population, where coal may be obtained at a moderate price. This avoids the saturation of the market for coke and tar and fluctuations in prices.

Coke oven gas manufacture is daily becoming more important, and the ready market for coal tar and its products, and the increased use of ammonium sulphate as a fertilizer is gradually driving water gas out of some of the large gas centers of the East.

Matters That Speak for Themselves

San Francisco, Cal., Jan. 28th, 1913.

Pacific Gas & Electric Co.,
445 Sutter St., San Francisco, Cal.

Attention Mr. H. P. Pitts.

DEAR SIRS:

We think it proper and neighborly at least, to manifest to you our appreciation of the services rendered us and the interest taken in connection with the Electric installation now in place and to be furnished at our plant at South San Francisco, by the Industrial Department of your company. In all our business meetings and conversations it was self evident that the sale of current was not the sole object in view but a satisfied consumer was equally desirable. We are pleased to say that information concerning the power and equipment was readily furnished us, which was always fair and unbiased.

Trusting our relations may continue the most cordial, we remain,

Very truly yours,
Pac. Coast Steel Co.
By E. M. WILSON, President.

February, 4th, 1913.

Pacific Coast Steel Company,
Rialto Building, San Francisco, Cal.

Attention Mr. E. M. Wilson, President.

GENTLEMEN:—

We beg to thank you for your letter of January 28th, and wish to assure you that we will always feel it our duty to try to furnish you service, realizing, as we do, that in closing a contract with a consumer it is necessary to "live" with him during the term of the contract, and, therefore, every effort is put forth to make it as pleasant as possible.

It is fitting at this time to congratulate you upon the grade of material which you are turning out in your plant, also upon the rapid and substantial growth of the plant which, in the course of several years, from almost practically nothing, has grown to an installation requiring some 1,200 electrical horsepower operating twenty-four hours per day.

Trusting that our relations may continue as in the past, and wishing you every success, we remain,

Yours very truly,
H. P. PITTS,
Industrial Engineer.

ITEMS OF GENERAL INTEREST

The Appliance Show and Demonstration at Woodland last month was a great boost for "Pacific Service." All of the residents of the town, whether consumers or not, received an invitation through the mail. Most of them responded, and some called each day of the show. The attendance was good for each day and a great many people came in the mornings.

During the entire three days Mrs. D. R. Withers made coffee on an electric percolator which was served to our visitors. In addition cake baked either in the gas or electric range was always waiting to be eaten by the interested callers.

A decided hit was made when doughnuts were served that had been cooked in an electric chafing dish.

Woodland is in the center of a farming district and many questions were asked regarding irrigation. To show how the electric motor can be used to pump water a small pumping plant had been connected up in the window. This was kept in operation all of the time and it was not unusual to see as many as a dozen people standing outside of the window watching the water flow through the little orchard.

A demonstration of the different kinds of electric lights was made and a great many questions answered regarding different forms of illumination.

A number of good prospects were secured and considerable new business will be closed as a direct result of the show.

The regular monthly "Get Together" meeting of the Oakland Pacific Service Club was held at Woodmen's Hall, Oakland, February 18th, at 8 p. m.

"Pacific Service" Appliance Show at Woodland office

The object for which the club is formed is to foster and promote the common interest of the employees of the PACIFIC GAS AND ELECTRIC CO. through association, and to advance, by lectures, readings and discussions, knowledge in matters pertaining to the generation, distribution and sale of gas and electricity.

Mr. A. U. Brandt, Superintendent of Electric Distribution for Oakland and Alameda County Districts gave an illustrated talk on "Electric Distribution." He showed that the problem of perfect service is greatly dependent upon the distributing engineer. Maps of the Company's distributing system were shown explaining the various voltage losses entailed and conditions encountered in final delivery to the consumer. The system of placing sub-stations in different portions of the city for the purpose of taking care of certain districts was explained as also the ability to cut out trouble in certain sections without interfering with the other sections. The subject was ably handled in an elementary way so that all employees could have a clear understanding so as to be able to explain to outsiders the efforts which are being made for perfect service.

Mr. S. J. Lisberger, Superintendent of Electric Distribution made a few remarks as to the company's policy and relationship of employees in the various departments.

Mr. C. J. Wilson, Assistant Superintendent of Electric Distribution gave a talk on the purposes of the National Electric Light Association. He emphasized the importance and magnitude of the Association for the education of employees of the Electric Departments in the large power companies throughout the United States.

A cozy corner in our San Mateo District office

Grandma's cookies were then distributed. These were mixed by Pacific current and cooked by Pacific gas. A local firm is introducing them to the grocery trade.

The evening's entertainment closed with the following program:

Piano Selections—A. C. Donaldson, Gas Meter Dept.
Baritone Solo—C. H. Oliver, Collection Dept.
Oboe Solo—J. Lind, Gas Meter Dept.
Songs (Hill Trio)—Crawford Hill, Billing Dept., George Hill, Louis Hill.

Accordian Selections—J. B. Ravano, Alameda Co. Dist.
Story Telling—W. E. Hogarty, Gas Inspector.
Piano Accompanist—W. A. Helwig, Timekeeping Dept.
Songs—Lee Gilbert.

There were over 250 employees present at this meeting.

E. C. Johnson of the Accounting Department is president of the Oakland Pacific Service Club. George Wagner of the Electric Meter Testing Department, is secretary, and the following constitute the Board of Managers:

J. Chrysostomo, Jr., Commercial Department; H. Beckman, Accounting Department; W. Blakely, Gas Department; R. W. Giesenhofer, Alameda District; W. H. Biers, Berkeley District; F. C. Marston, Inside Electric Department; P. F. Wilson, Outside Electric Department; L. Whitehurst, Oakland Power Districts.

Heads of departments are not eligible to administrative offices in this organization.

Manager Frank Leach of the Oakland District is constantly to the front with some unusual experience. Here is his latest, which may prove of value in explaining one of the many problems with which "Pacific Service" is apt to be confronted:

"We received a large number of no gas complaints, all coming from the same vicinity. Upon responding, we found indications of water in the services. This was duly pumped out. At last the cause of the trouble was located. It appears that a party moving into one of the houses undertook to install a coal range himself. This he connected to the kitchen boiler and then connected the hot water outlet pipe from the range to what proved to be the gas fuel line and then went out to look for the water cock to turn on the water. Thinking that the cock on the inlet connection of the meter was the water-cock, he turned this on but still there was no water. He then went out to the curb and finding a cock there, turned it on, causing the water to flow through into the boiler, out through the range and thence through fuel line into the meter and out into our service mains.

"A great amount of trouble would have been caused had it not been for the expressman who noticed the water-pipe connected to the gas pipe and shut the gas-meter valve off, pending the return of the would be plumber. Aside from the labor involved, there were 7 meters in the neighborhood damaged. This illustrates one of the many causes for complaint which may be caused by conditions beyond our control."

Kind words are always encouraging, but it is not often in these days that they come to a public utility corporation, no matter how well they may be deserved. Hence it is not without a little pride that we quote the following from a letter received from Edward Brown & Sons, General Insurance Agents, 202 Sansome Street, San Francisco, written upon receipt of a check in settlement of a claim for damages arising from a fire started from escaping gas in the Fresno District some time ago:

"We are returning herewith releases, signed as requested, and must take this occasion to thank you for the consideration you have shown in this case. It is never pleasant, however just a claim may be, to have to foot a bill, the result of carelessness, and from which no benefit whatever is derived. Under the circumstances we are more than pleased to testify that the Pacific Gas and Electric Company has in this instance quite lived up to its advertised motto."

Another Acrostic on "Pacific Service"

Pacific, in its name, and service.
Also because of its location.
Comprehensive in its business.
In its management, dignified and respected.
Friendly to all merit.
Indulgent to its co-workers.
Consistent in its methods.

Secure in its sources of production.
Eager for progress.
Responsive to all calls.
Versatile in its capacity.
Inimitable in its entirety.
Courteous to the public.
Enthusiastic to the core.

DOINGS OF OUR COMPANY SECTION
N. E. L. A.

OFFICERS AND STANDING COMMITTEES 1912-1913

OFFICERS

Chairman: A. R. Thompson, San Francisco, Cal.
Vice-Chairman: J. D. Kuster, San Jose, Cal.
Secy.-Treas.: Henry Bostwick, San Francisco, Cal.

EXECUTIVE COMMITTEE

S. V. Walton, San Francisco, Cal.
F. H. Varney, San Francisco, Cal.
C. J. Wilson, San Francisco, Cal.
Geo. H. Bragg, San Francisco, Cal.
R. C. Powell, Oakland, Cal.

STANDING COMMITTEES

Papers and Meetings:
S. V. Walton, Chairman, San Francisco, Cal.

Membership:
F. H. Varney, Chairman, San Francisco, Cal.

Question Box:
C. J. Wilson, Chairman, San Francisco, Cal.

Editorial:
H. Bostwick, Chairman, San Francisco, Cal.

The regular monthly meeting of the Pacific Service Section of the National Electric Light Association was called to order at 8:15 o'clock p. m., February 19th, 1913, Chairman Thompson presiding. There were 262 members in attendance.

The minutes of the regular meeting of January 15th as well as those of the Executive Committee meetings held on January 22d and February 19th, were, upon motion duly made and seconded, approved as read.

The next order of business being the reports of the standing committees, the chairmen of the several committees reported as to their respective activities.

Chairman Thompson then announced that Mr. C. A. Gaines of the Electric Distribution Department would read a paper on the "Location of Faults in Underground Cables." Mr. Gaines read an extremely interesting and instructive paper, and by means of various instruments used in his daily work demonstrated to the members, in a very concise manner, the methods pursued by the Distribution Department in solving the problems often met in large distribution networks. At the conclusion of the reading of the paper by Mr. Gaines, Mr. Lisberger, Engineer of Electric Distribution, was called upon to open the discussion, in which the following members participated: Messrs. Powell, Piatt, Cowles, Knopp, and J. W. Varney.

Upon the conclusion of the discussion the Chairman called upon Messrs, Scarfe of Nevada City, Godbold and Mosher of Oakland, and McManus of San Francisco, who all expressed themselves as being agreeably surprised at the interest manifested by the employees in the affairs of the Company Section.

There being no further business to come before the meeting, upon motion duly made and seconded, the same was adjourned, and Mr. Walton as Chairman of the Papers and Meetings Committee, announced that he had provided some entertainment.

Henry Bostwick, Secretary.

Notes — By the Editorial Committee

Take time to look over the Question Box.

Our Editor of the Question Box has noticed an absence of replies to the questions pertaining to hydro-electric, illumination and domestic appliances. If the employees of these departments would take a few minutes of their time to answer such questions, they would be conferring a favor on all members of the Section.

While the questions propounded may be simple problems to those who are daily employed in the particular line of work covered by the questions, to others of us they are complex, hence our desire to be enlightened.

There are also some of us who desire to be enlightened on some auditing problems. Where are all the auditors?

It will be of interest to note the following representation at our February meeting from our several districts and divisions:

Antioch 1, Berkeley 7,Colusa 1, Colgate 1, Contra Costa 2, Chico 1, de Sabla 1, Electra 2, Grass Valley 1, Marin 18, Marysville 1, Napa 2, Nevada City 1, Nevada Power 1, North Tower 6, Petaluma 1, Placer 1, Redwood 3, San Jose 5, Sacramento 2, Solano 8, South Tower 2, Santa Rosa 1, Stockton 1, Fresno 1, Vallejo 1, Woodland 1, Oakland 43, San Francisco 146.

The following incident tends to prove the practical results brought about by employees meeting at the last Company Section.

One member of the Commercial Department chanced to look across the room and behold, there sat his former school teacher of six years ago. Needless to say, there was a warm greeting with the words, "Well, I am glad to know we are both under the same roof again."

It is suggested by the Commercial Department that later on, when our Company Section perfects its organization, a debating team be selected and some of the knotty problems solved in this way. Such questions as the much-mooted "Resolved, that Central Stations should sell incandescent lamps," might be a good one to get action on the start.

The members of the Company Section wish to extend through these columns their heartiest felicitations to the "Pacific Service Club of Oakland." Such get-together movements cannot but help to cement a feeling of good fellowship between employees, and where that exists you find a perfect organization, which means "Pacific Service."

Our get-acquainted cards will be continued. We trust that all members in attendance upon our meetings will take time to fill them out properly, and turn them in before leaving the hall, as they form the basis of our record of members in attendance.

Remember that there are five representatives of our Company Section to go to Chicago in June, to be in attendance upon the N. E. L. A. convention; and now that it has been decided to hold the N. E. L. A. convention in San Francisco in 1915, our delegates will no doubt be asked a great many questions concerning Exposition matters.

OAKLAND DISTRICT: The last meeting was a good one; shows what we may expect. The subject of underground faults was well handled. Those in other lines who thought they were the only ones who had trouble soon dispelled the illusion. It lightens our burdens to know the other fellow has complications and when we learn how cleverly he clears them, we want to set to on ours.

Those who have papers should remember that the meeting is made up from all departments. Try to make papers simple; brief in technicalities. It takes a master to simplify. Your fellow craftsman will recognize that you handle the subject well; he will have learned. This learning fills a hunger common to all. If the subject is shot over our heads, the meeting will not be a success.

? # QUESTION BOX ?

PACIFIC SERVICE SECTION N. E. L. A.

C. J. WILSON, Chairman, Question Box Committee

All correspondence relative to the Question Box should be sent to C. J. WILSON, CHAIRMAN OF QUESTION BOX COMMITTEE, C/O PACIFIC GAS & ELECTRIC CO., 445 SUTTER STREET, SAN FRANCISCO.

Contributions received prior to the 25th of the month will be published in the issue of the Magazine of the following month.

Each question should be submitted on a separate sheet of paper, preferably typewritten. Sketches, diagrams, etc., which accompany questions or answers, should be made with black drawing ink on white paper; letters and figures being of suitable size for reduction. All questions and answers submitted should bear the name of the person submitting same. Questions will be published without the name of the propounder. Answers will be published with the name of the member answering same.

EDITORIAL:—The interest shown by members of our Pacific section in answering questions has been very gratifying to your Committee and we trust that the answers published in this issue will prove not only interesting but instructive to the members.

We regret that due to the limited space allowed us in the Magazine, we are unable to publish all questions and answers received, but we have hopes that in the near future this difficulty will be solved either by our being allotted more space in the Magazine or through the medium of a separate publication devoted to Company Section matters. Answers have been received to 21 of the 28 questions that were published in the February issue. However no answers under "Hydro-Electric" heading nor to questions Nos. 1.3212-1, 1.3282, 1.331, 1.34112. We feel certain that answers to these questions would be particularly interesting and solicit the efforts of members who are in position to answer same.

While your Committee does not agree as to the accuracy of certain answers, we feel that their publication will elicit interesting and instructive discussion.

Mr. R. Eliason of the Oakland Meter Dept. has brought out a very pertinent point in the suggestion that answers to questions similar to 1.372-1 be withheld from publication for the reason that unscrupulous consumers might apply such information to their gain and Company's loss.

Answers

0-1 Why will concrete not set well when mixed with sea water?

PAUL R. SHIPLEY.—Concrete will set nearly as well when mixed with sea water; the only draw back is that it will take a great deal longer to dry out. This is a very good feature as it leaves air cells in the concrete, which have a tendency to leave it more elastic; consequently stronger. In cold countries salt is commonly used to mix with "liquid stone."

0-2 How are the electric switches on the Market Street car system operated and what connections are required in order that a McAllister Street car will open the switch at McAllister while a Hayes Street car will pass this switch but open the one at Hayes Street?

THOS. E. FOGALSANG.—There is nothing special on the cars that enters into the switching arrangement asked about. Any trolley car will close and open the switch. If the switch is to be thrown either way, the motorman leaves his controller switch on the first, second or third contact, then as the trolley wheel passes from the line to the circuit breaker switch, it makes contacts with wires leading to the relay switch on the pole, which in turn relays current to the solenoids or magnets that works the track switch. There are two contacts on this line breaker switch, one operates the switch one way and one the other. The car trolley, and motors, having connection to the rail, act as a single pole switch, which operates the relay. Wires are run from the trolley wire, and line breaker to the relay, and from the relay to the solenoids of the switch.

1.313-1 Why is it that D. C. motors can be operated at variable speeds and A. C. motors can only be operated at constant speed?

R. A. GENTIS.—Certain types of A. C. motors may be operated at variable speeds, but for close speed regulation D. C. motors are preferred. The squirrel cage induction motor in common use however, cannot be operated at variable speeds, since the rotation of its rotor is dependent on the progressive shifting of the magnetic poles produced in the stator by the alternating current, which in the case of a two pole motor would move once around the inner circumference of the stator during each cycle of the current applied. These rotating magnetic poles induce currents into the rotor, the tendency being to revolve the rotor at the same speed as the constantly revolving poles in the stator, that is, at no load a two pole motor would complete one revolution for each cycle of the current applied or 3,600 R. P. M. when connected to a circuit of 60 cycles per second. Hence the R. P. M. of a squirrel cage motor is constant at a given load and is equal to the number of cycles per minute of the circuit divided by half the number of poles in the stator. The speed of D. C. motors is controlled almost entirely by varying the applied voltage in either the field or armature in the case of a shunt motor, and in both in the case of a series motor. The speed at which these motors run is such as to produce the counter E. M. F. necessary to allow the flow of just enough current in the armature to give it a torque. Thus: If the field strength of a shunt motor be increased, the armature will be able to generate the necessary counter E. M. F. at a lower speed, also should the field be weakened, the armature must speed up in order that it generate a counter E. M. F. or voltage equal to that which it would generate if it were driven at that speed as a dynamo.

1.313-2 Can a motor be made to operate on both AC and DC and 110 and 220 volts?

PAUL R. SHIPLEY.—Any direct current motor (series) will run with A. C. current, if its magnetic structure is constructed to prevent heating from the alternating flux. The motors of the N. Y. N. H. & Hartford railroad are A. C. and run equally as well on the N. Y. Centrals system of D. C.

THOS. E. FOGALSANG.—Any motor cannot be made to operate satisfactorily on both A. C. and D. C. or 110 or 220 volts. There are motors made that run on both A. C. and D. C. Such motors as a rule are made for special work, usually in small sizes for vacuum sweepers, sewing machines, etc.

1.3133-1 Three-phase current is wanted for testing purposes, where only a single-phase supply is available. Can a three-phase induction motor, brought up to speed by some means and then run single-phase, be used successfully as a phase converter?

THOS. E. FOGALSANG.—A three-phase induction motor would not produce three-phase current for testing purposes. To be an induction generator it would have to run over speed. This it would not do as a polyphase motor run on single phase. If only a small amount of power is required, two small transformers and a condenser with the Bradley connection might do. This is somewhat similar to the Scott connection, but is produced from one phase.

1.31331 What are the functions of reactance coils on a turbo-generator and how are these functions performed?

THOS. E. FOGALSANG.—Reactance coils are used on large turbo-generators to limit the amount of energy that can be dissipated in a short circuit, and therefore protect the generator armature from damage; also the switching apparatus. The amount of current that can be generated on short circuit might amount to twenty times full load amperes, but with reactances this is limited to eight or ten times full load. The coils have a certain reactance, or choking down of volts with a certain amount of current passing, which increases in direct proportion. Eventually the choking is so great that the kilowatts developed at the short are very much limited, due to a rapidly falling potential.

1.31334 What are Mercury arc rectifiers, when are they used and for what purpose?

THOS. E. FOGALSANG.—A mercury arc rectifier is an exhausted glass bulb containing mercury. Two anodes at the top provide ways for the entrance of the alternating current, while a cathode at the bottom, leads the direct current out. When the mercury is hot, a vapor is formed that has a very high resistance; is almost an insulator. When this vapor is broken up or ionized, however, it acts as a good conductor, but in one direction only. The alternating current enters the tube, and the impulses of a certain direction are gathered, and flow in a positive direction only. Rectifiers are used for all purposes where it is necessary to change small amounts of A. C. to D. C. without large cost of apparatus. They are used extensively for charging automobile storage batteries, street lighting and in moving picture shows. (Similar answer received from Paul R. Shipley.)

TRANSFORMERS.

1.31343-2 Please explain why a current transformer gives a much higher voltage across the secondary on open circuit than on closed circuit.

THOS. E. FOGALSANG.—In a current transformer, when the primary is carrying a current and the secondary is closed so that it is carrying a current, the magnetizing effect of the secondary is in opposition to that of the primary, and the flux in the iron is limited to that necessary to set up a small potential in the secondary. Open the secondary and the retarding flux is removed, and the primary has full magnetizing effect on the iron, and sufficient flux is set up in the iron to induce a high potential in the secondary winding.

1.31343-3 What action takes place when a transformer is out on the line working, to make the compound deposit from the core to case through the oil? I might add that this compound will not adhere to side of an iron receptacle unless held there with the oil at a temperature of 130°C. The compound will fall to bottom of receptacle.

THOS. E. FOGALSANG.—The deposit you speak of is a compound that the transformer coils are impregnated with, and was put into the coils to act as insulation and to keep out moisture. When the coils are running quite warm, or hot, this compound works out and oil takes its place. In its liquid state, it works out into circulation with the oil, to the case to cool, as does the oil. It comes into contact with the cold surfaces, solidifies again and drops to the bottom.

1.31343-4 What is the reason for providing such large air space between the primary and secondary in some current transformers, and thereby increasing the resistance and reactance of the primary winding? This feature seems to apply more or less to all current transformers but is particularly prominent in the GE K8 & Westinghouse type E.

THOS. E. FOGALSANG.—One of the principal things to be considered in transformer work, is to make it impossible for the primary to break down to the secondary. In large transformer work this is admirably done, as there is plenty of space for insulation, and the oil adds to the safety. The Types K8 and E are for high voltage, and generally large current capacities, and must be well insulated. This means rather few turns of large wire on the primary, which must be well insulated for open work. The resistance does not amount to much and the reactance not enough to be considered. The main thing is to build them so that they do not break down. The space is allowed for in the general calculations.

TRANSMISSION AND DISTRIBUTION SYSTEMS.

1.3211 Would like to know some practical method of locating a ground on a DC two wire network where both positive and negative sides are to be kept clear of grounds. Service must not be interrupted while locating the ground.

THOS. E. FOGALSANG.—The fact that there is current on the line would prevent your using any instruments to make a test with, unless you established another ground on the same side of the circuit, and then did the testing between grounds, in which case some standard of resistance would have to be established before a calculation could be deduced. The most practical way is to split the network into parts, taking one at a time and test with a magneto or other set, until the ground is located. With a test lamp, you can always find which leg the ground is on, but this is about as far as is practical with the lines in service.

1.312-2 What is the cause of a 4KV line burning down close to the Station when the actual short is about a half mile away?

THOS. E. FOGALSANG.—There may have been a weak place in the wire, which, being between the station and the short might burn off due to the increase in current caused by the short. Or, in the case of such a line with a grounded neutral, and wet weather prevailing, and a defective insulator, a short to ground on one leg, may have started it also at that point.

1.3221-1 Why does star connection of distribution line cause less induction on an adjacent telephone line than delta connection?

PAUL R. SHIPLEY.—Star connections as a rule have a neutral point, and the wire leading from this point is generally grounded on the system. And with a "phone" line naturally grounded at each station, no susceptible induction is felt.

1.3221-2 Would the ordinary Locust insulator pin (size 1½" x 9") be strengthened and its life increased if it were dipped in boiling Linseed oil or some other suitable oil?

THOS. E. FOGALSANG.—This used to be considered an advantage when wooden pins were used on high tension lines and before iron ones took their place. It prolonged the life, as well as to a great extent, keeping out the moisture and preventing the pin from swelling and cracking the insulator. The pins were boiled in linseed oil.

PAUL R. SHIPLEY.—Any oil is supposed to be a good wood preserver. The leakage current over an insulator to a pin, on certain high voltages, forms nitric acid from the nitrogen in the air, and from the hydrogen and oxygen in the moisture, this acid eats into the pin, and its becomes pulpy. I know of no tests that have been made on oil impregnated pins, and therefore do not know if their usefulness would be prolonged by the use of oil.

1.32222 What is the best way to cool a transformer manhole which stays excessively warm?

Thos. E. Fogalsang.—About the only way to cool a manhole would be to establish a circulation of air. Cold air must come into the duct line some place. Opening up another manhole toward the direction from which a breeze or the wind is coming will provide some circulation. A funnel placed over this same manhole will produce a draft in the hole. Of course we are considering that it is impossible to produce draft with a fan.

1.3283 A consumer having a 220 V. 2-wire service fused with 10 amp. fuse connects a 110 V. 500-Watt electric iron to a lamp socket. What will be the effect on the iron and fuse? Assuming that he connects a 110 V. 40-watt lamp to the above socket, what will be the result?

Thos. E. Fogalsang.—On a 220-volt service, only lamps and irons wound for 220 volts should be used. In your case, if the fuse did not blow at once due to the increase in amperes, the resistance wire of the iron must burn out, in which case it would cause a short circuit that would blow the fuse. If the fuse blows first, it saves the coil of the iron. A lamp would burn out for the same reason and might blow the fuse.

MOTOR DRIVES.

1.342 What type of motor should be used to drive a pump supplying a house tank and operating under the following conditions? The motor is started and stopped automatically when the pressure in the tank gets below or above the desired limits, and the tank is so small that for a large portion of the day, the motor will run for 3 or 4 minutes, then stop for 2 or 3 minutes, that is, the motor will be started once in from 5 to 7 minutes. The horsepower required is 7½, and the available supply is 550 volts DC and 220 volts, 60 cyc. single-phase.

Paul R. Shipley.—I would say to use a shunt wound motor on the 500 volt DC. And a squirrel cage motor (induction) on the 220 volt AC single-phase circuit.

Thos. E. Fogalsang.—The DC motor would be best in this case as it looks like a remote or residence district, which means that the regulation on the single phase line must be considered. A 7½ H. P. single-phase motor, starting and stopping continually will upset the regulation unless there is considerable transformer capacity. A DC motor with automatic switch and starter, should work satisfactorily, probably of the type that operates the air compressor on street cars.

New Questions

ELECTRICAL ENGINEERING

1.311 What is the most economical method of supplying direct-current for motion picture machines from an alternating current distribution system?

1.3133-2 What are the relative advantages of Synchronous and Induction motors?

TRANSMISSION—DISTRIBUTION

1.3212-3 What is the percentage of line loss in a long distance high tension transmission system, and what becomes of the energy thus lost?

1.3212-4 What should be the maximum horsepower connected on open delta?

1.3212-5 We are using the two phases of a three-phase circuit for operating some street lighting. How is the voltage drop for such a system calculated?

1.3213 When 3 different circuits, such as a 500-volt DC 220 volt AC and a telephone are encased in one conduit, (metallic or fibre) what electrical action takes place between the different circuits?

ARC LAMPS

1.33512 Simultaneous readings of voltage, current and wattage were taken on an AC arc, the voltage being that across the arc only, and it was found that the ratio of indicated watts to volt amperes varied from .50 to .95. This circuit contained only the arc and no reactance. Why was the power factor not unity?

HEATING

1.3411 Has any electric appliance been perfected that will heat water as well and as cheap as the gas circulating tank heater?

1.34112 What results have been obtained with the Copeman Electric range?

ACCOUNTING STATISTICS

2.1 What is the meaning of "focal date" and how should it be determined?

2.3-1 Explain method by which work done on a GM is finally charged in the proper construction account in the district.

2.3-2 Why is cost of hanging transformers classed as an operating expense? Should not the original labor cost of installation of the transformer be chargeable to construction?

2.3-3 An investment of $20.00, half labor and half material, requires replacing. Due to improved methods of manufacture the cost of the new article is now $6.00, but on account of extra labor to remove old article the replacement labor amounts to $13.50. Allowing a salvage of $1.50, how should this account be segregated on our standard GM form? Should the original labor be considered? What is the depreciation?

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EDITORIAL

An article written for the New York Commercial by Mr. H. M. Byllesby and published in that journal December 14th, last, presents the great problem of the public service corporation from a capital investment standpoint in such clear, concise and instructive fashion that we deem it worthy of more than ordinary notice in our own columns at this time, when service and service rates are matters of every day discussion.

Mr. Byllesby opens with the statement: "There is no other line of industry requiring the continual increase of capital investment demanded by the enterprises broadly embraced under the term of 'public service corporations,' including electric light and power, street railways, steam railways and their terminals, telephone, and gas companies. The extent to which the vast and heretofore continually increasing commercial and manufacturing transactions of our great country are dependent upon the continued development and able management of such corporations is not at all understood by the great mass of the voting public. A community which by accident, design, or misfortune is poorly served by any of the so-called public service corporations is a community which necessarily is behind-hand in its material development. A community suffering from faulty equipment or management of its public service corporations likewise endures a consequent loss of material advancement with attendant inconvenience and dissatisfaction.

"The amount of new capital for purely conservative and necessary development and extensions of public service corporations annually reaches figures utterly beyond the comprehension of the average individual who is not personally cognizant of the operations and affairs of such companies and enterprises. The stability of their income under normal conditions and without unfair restrictions and interference is more pronounced, I believe, than in any other line of human enterprise."

The writer proceeds to discuss the history of public service enterprise in this country, paying just tribute to the energy and courage and far-sightedness of the pioneers, and calling attention to the great risks incurred and the huge sums of money invested, not always with profitable result. But, writes Mr. Byllesby: "Opportunities are still presenting themselves in every direction and there is a crying demand for further extensions of service." And he asks the question, how are these extensions to be made unless the enterprises responsible for them receive the proper amount of encouragement to proceed? And the writer regrets to observe a general tendency on the part of the law-making bodies of the present day to hamper, not to say curtail, the public service corporations in their efforts to comply with the ever-increasing demands of the public they serve.

There is a good deal of stern criticism of the new order of things in Mr. Byllesby's article. He says: "A new situation and new conditions are now confronting the public and these corporations. It is time for the underlying common sense of our people to take these questions out of the hands of the muckraker and professional politician and to put them before the great tribunal of common sense and love of justice of the American people. Our country has reached a point of intelligence and development where it should recognize, and at some time will recognize, that these questions are of such deep and far-reaching importance that they should be placed in the hands of entirely non-political tribunals, fair-minded, experienced and candid, and who will carefully weigh all the questions involved with a proper attention to the economic questions and with a full realization of the obligations of common honesty resting upon all of us to each other, to the investor, to the wage-earner, and to the communities concerned.

"If the laws and various commissions dealing with these subjects approach them with a desire to encourage enterprise and not to throttle it; if rewards are allowed to follow the energetic development and the hazards of these corporations, and if these laws and commissions recognize that their object is two-fold—first to protect the public and the State against selfishness, and equally, on the other hand, to protect the capital and the brains and the enterprise of these corporations against unfair restrictions and the embarrassments of paternalism—these corporations can continue serving the public and under terms and conditions which will be far more satisfactory to them than the uncertainties and hazards of the past, and, at the same time, due to the removal of these uncertainties and hazards, the public and the State will be served with even a better service and under more favorable conditions of charge than in the past.

"Very nearly the entire water-power development industry in this country is held up at the present moment awaiting the settlement of the question of dealing with water-power sites by the various governing bodies. It should not be a difficult matter, and it is not a difficult matter, to formulate rules and regulations which, while amply safe-guarding the State and the citizens, will also enable these potential water-powers to be turned to useful account in the development of the country and conserving of the fuel supply."

In this article Mr. Byllesby has but voiced the common sentiments of public service companies all over the country. The topic was discussed at the N. E. L. A. convention in Seattle last June, when Mr. H. L. Doherty, Judge Richard Ballinger, formerly Secretary of the Interior, and Mr. John A. Britton in no uncertain terms criticised the attitude of the Federal Government in regard to its policy of so-called conservation. We venture to think, however, that the hour is ripe for a better all-round understanding of these matters, to the end that the march of progress and development be not hindered by blind legislation.

Under the heading "The Manufacture of Coal Gas" we reproduce in the present issue of Pacific Service Magazine the first of a series of lectures now being delivered at the University of California to the students in gas-engineering. The lecturer is Mr. E. C. Jones, our well known gas engineer.

The idea of a course in gas-engineering at the State University was first presented by Mr. John A. Britton, who is a member of the Board of Regents, and who set the ball rolling in a lecture delivered by himself at the University in January. Mr. Britton was brought up in the gas business, so to speak, knows its history from the beginning and has every fact and circumstance connected with the various stages of its development at his finger-ends. His lecture, then, was comprehensive in character and was given as a preliminary to the course of lectures to follow, (each of which will be devoted to some particular method of gas-production.)

The cost of this newly established course is being defrayed out of a fund raised for the purpose by the Pacific Coast Gas Association, (of which Mr. Britton has been both Secretary and President and in which he takes a very active interest.)

Gas Supplanting Oil and Coal as Fuel in Hotels, Restaurants, Clubs, Etc. Also the Echoes in Return

By L. L. CAMPBELL, Industrial Department.

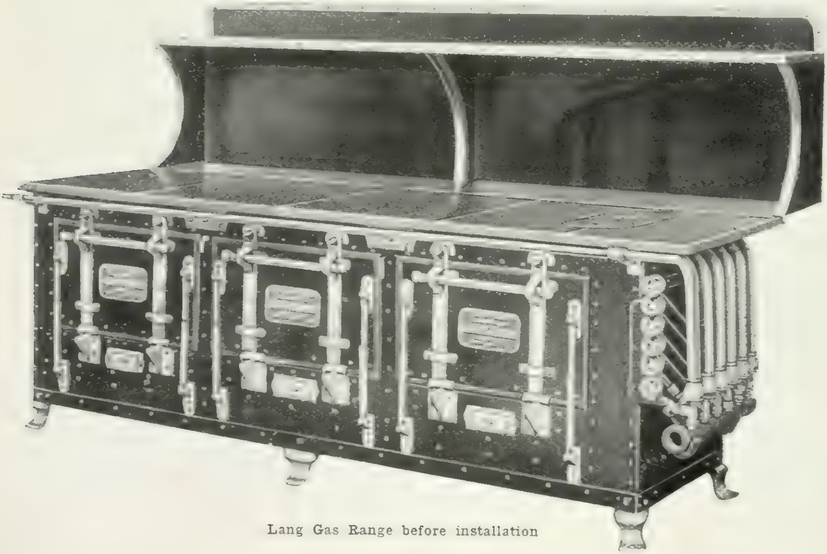
L L Campbell

Luxuries of yesterday are necessities of today. Vast strides in productive improvements have kept pace with the progress of the age. New methods and new machinery work wonders.

In no instance is this more marked than in Industrial Gas Engineering for fuel purposes. Every large gas company in the country is trying to revolutionize the gas business for industrial uses, and is succeeding. Today, from Maine to California, managers, stewards, and chefs are great users of gas as an every day progressiveness. Until recently oil was the universal fuel used in hotel ranges on the Pacific Coast. This was probably due to the fact that California is the *great* oil producing state, and the proximity of the fields made oil very cheap as a fuel. But the introduction of the Lang gas range on the Pacific Coast has, to a certain extent, revolutionized the fuel problem.

The Lang gas range by burning from one-quarter to one-third less gas than any other range on the market has brought gas as a fuel to a more competitive basis with oil. Many people have shown their preference for gas as a cleaner, safer and more convenient fuel by installing the Lang Gas Range. The fact that many people in San Francisco and vicinity have installed it in preference to oil or coal, should influence those in favor of gas in the East or points far removed from the oil fields, where oil is much more costly.

Gas is universally acknowledged by hotel men to be more desirable as a range fuel than oil or coal, and the fact that the Lang Gas Range has made such progress in the heart of the oil producing district puts a different light upon the fuel problem con-



Lang Gas Range before installation

Range installed at Golden Poppy Restaurant, 437 Market St., S. F.

fronting the hotel man throughout the entire country. Here are some arguments in favor of the gas range:

Cheaper than coal to operate, no fire to kindle, coal to cart, or ashes to haul; no repairs to buy, even circulation of heat and no waste. Absolutely reliable, no danger of fire losses from overheated surroundings or defective flues.

No trouble to have meals ready any time and all times. A sanitary kitchen in full view of the public.

No soot, dirt, smoke, ashes, clinkers, faulty flues or poor drafts. No dissatisfied chef due to unreliable coal or oil range.

Can accommodate any number of people at any hour of the day and make the kitchen inviting to public inspection.

No awakening of guests from early morning noise in kitchen. No complaint of extreme heat from near-by sleeping rooms.

No danger to guests and property loss through overheated flues. No building of hot fires two hours before meal time.

No expensive repair bills for grates, tops, linings, etc. No cold tops or irregular ovens. Gas is a uniform heat and modern fuel.

Gas fuel eliminates all kitchen troubles and inconveniences experienced with coal and oil ranges. Makes satisfied help a daily labor of pleasures.

Let me take you personally into the kitchens of those using the modern hotel gas range, broilers and bake ovens.

Modern hotel kitchens use gas fuel, other hotel kitchens are made modern by using gas fuel.

A match is all the kindling needed with gas fuel.

A hotel gas range will do all that a cumbersome coal and oil range will do, and do it in a genteel way.

No trouble to keep a chef if you use a closed top hotel gas range.

During the past year some success has been attained, and one success leads to another. I believe that all gas men will agree with me that this particular kind of business is the most difficult to obtain and one of the most valuable when it is secured.

Undoubtedly the time will come when all hotels and restaurant kitchens will be entirely gas and steam and I believe that within a few years a tremendous increase in the sale of gas for hotels and restaurants may be expected, when the educational work which we have been doing along these lines reaches full fruition.

A gas appliance salesman in this branch of the business should be a man peculiarly fitted for the work. The mere knowledge of the construction of hotel appliances which the company sells or recommends is not sufficient. He should be able to put all appliances to practical use and personally demonstrate what can be done with them. Unless he has this practical knowledge he is not equipped for results.

Suggestions for Line Insulation Maintenance

By THOS. E. FOGALSANG, Dept. O. & M. Steam Plants.

T. E. Fogalsang

With perfect line insulation and no line or insulator troubles, there would be few interruptions to service and very little generating or substation troubles. The best equipped station system must give the poorest kind of service if outside interruptions are allowed to reflect back to it.

A few years ago it was common practice to let lines run indefinitely, without inspection of any kind, or any attention being paid to the cleaning of insulators. With the advent of higher potentials this practice to a great extent has been abandoned, and it is now considered a part of modern practice to patrol the lines regularly and clean insulators at stated periods.

In certain parts of a city or along dusty country roads, insulators will require closer attention and more frequent cleaning than in other places.

In the States of Oregon and Washington they do not follow this practice so closely for the reason that it rains a great deal, not only in the winter months, but throughout the summer as well. This accomplishes two things, it washes the insulators, and settles the dust. However, we have heard of line conditions that developed up there, where insulators were cracked or broken, and the lines burned off. Extensive oscillograph observations failed to enlighten as to the causes.

Our opinion is that dirty insulators developed these effects, and were the insulators cleaned no doubt the troubles would cease. If a system operates nicely for quite a while, then gradually picks up troubles, it's quite plain that some little and growing thing has caused them. No doubt our northern brethren believe that it rains enough to keep their insulators clean. In this they might be perfectly justified were it not for the fact that there are a few dry spells in between, when some dust does rise and little by little is deposited on the underneath part of the insulator. Nothing but cleaning will remove it.

The lines near the bay and coast and, particularly, in San Francisco, require the closest attention and care. Dusty streets and roads, and much wind soon leave the insulators in a dirty state, while the banks of salty fog creeping in from the ocean add to the troubles. The insulators on all lines in San

Francisco from 2,400 volts up should be cleaned at least once in three or four years, while the 11 kilovolt lines require it oftener, about, every two or three months in the late Spring, Summer and early Fall. If these insulators are cleaned late in the Spring or just before the regular windy and foggy period sets in, the usual line troubles that appear at that time will be missing. So again, they should be cleaned finally in the Fall just before the first rains set in. Clean insulators prevent those line troubles that appear always at that time.

The Department of Operation and Maintenance of Steam Plants and substations in this district some years ago inaugurated a regular system of line patrol which has been maintained ever since. As a result, very little trouble has occurred on the 11 kilovolt lines. This Department is ably assisted and backed up by the Department of Distribution which attends to the cleaning of insulators.

The lines from Station "H" to "A" and "E" run through territory that is very windy, dusty and foggy, and at one time there was much line trouble. Another bad section is that through which Standard 1 and 2 lines run, to enter the city. But since those lines have been regularly inspected by a patrolman who takes an interest in his work, and the insulators systematically cleaned, practically no troubles have occurred there. Present conditions speak well for the management and patrol system of that division.

Porcelain insulators are superior for any line, but so long as they must be cleaned more attention should be given to the selection of more open types, so that pockets will not exist for the collection of dust; or if they must exist, to make them as open as possible, so that each part can be readily cleaned. The disc or suspension type is best, as it is more open and can be thoroughly cleaned. In selecting this, or any type, no small corrugated or fluted undersurfaces should be accepted, as they present too many pockets and are difficult to clean. It is better to take a disc that is more open and smooth, even though it has less surface, making up by adding more discs to the string. Insulators must be cleaned, and the more quickly and thoroughly this can be accomplished, the more dollars saved. Cleaning insulators has developed the fact that many cracked and faulty ones exist on the line unknown to the party that patrols the same.

Too much regard is paid to manufacturers' claims for their particular insulators as to which is best for certain conditions. Experience has proven that an insulator that has worked satisfactorily under certain conditions in one part of a country did not do well in another. Large companies should develop a type best suited to their conditions, and have them manufactured and tested. Sometimes testing proves nothing. Insulators have been put out on lines in this State that withstood a dry test of 120 kilovolts, yet these same ones broke down and gave trouble when run under 30 kilovolts on the line.

Insulators on magnetic arc lines should have double the surface of those operated on lines of equal A. C. voltage. Insulators having ample surface and of open type should be used in the dust and fog belts. Regular patrol and cleaning periods must be maintained, and patrolmen must take an interest in their work. The successful operation of the system depends on how well and faithfully each patrols.

Some questions have arisen as to who should patrol lines. Our experience has proven that, as a rule, old and seasoned linemen do not do the best. The "hikeing," as they call it, and keen observation necessary to pick up faults is not to their liking. Generally, a man that does not work on the lines at all will make the greatest number of discoveries. In this work, a patrolman can assist himself greatly and remove a strain from his eyes by the use of a field glass. Cracks are shown up, and look big.

Noting Progress of the World's Fair

President Charles C. Moore of the Panama-Pacific International Exposition in a Washington's Birthday announcement to the people of California stated that a careful review of progress upon the exposition enabled the management to repeat and emphasize its promise made a year ago that the exposition will be ready in every detail and opened on the morning of the day announced, February 20th, 1915.

A record number of applications for participation by foreign nations, as well as States and territories of this country has assured the most comprehensive display ever made. To date the applications for concessions exceed in numbers and excel in originality any similar features of previous expositions.

The illumination of the Exposition will form a remarkable attraction. The work is under the direction of Mr. W. D'A. Ryan, who has perfected a scheme enabling him to produce light effects undreamed of at any of the former world's expositions. In this there will not be a single article of lighting equipment that was ever used before. A sum exceeding $50,000 has been expended in a single line of experiment in the development of cut-glass reflectors, to be known as jewels for use at the exposition. The results to be produced will be of a startling and scientifically wonderful nature.

The Harbor View site presents a scene of lively activity today. Thousands of men and teams are at work. Several hundred acres of land have been filled in, graded and laid with roadways and railroad tracks along the bay shore which forms the northern boundary of the exposition grounds. Steam cranes, dredges, motors and mule teams by the hundred are at work in the building preparations now making great strides at Harbor View. Millions of feet of lumber are being unloaded on the exposition site. The buildings are fast being raised, giving, as yet, but a faint impression of the beauties that are to be. Following is a resume of work done on the site:

Reclamation of Harbor View lands and Presidio completed. More than 1,500,000 cubic yards of bay sediment used.

Completion of sea-wall completed along water front of the grounds.

About 90 per cent, or two miles of site fenced.

Service building, first exposition structure, completed and occupied.

The greenhouses and potting houses for exposition shrubbery and plants completed.

Asphalt roadway through Fort Mason reservation built.

Four oil tanks have been removed, besides scores of smaller structures.

Gas retort house removed.

North service sewers, 3,000 feet long, completed.

Sanitary and storm sewers, forty miles long, in foreign and state pavilion sections, under construction.

Service sewers in foreign pavilion site, 3,000 feet long, 95 per cent completed.

Wharves and bulkheads nearly half completed.

Contract let for ten miles of high pressure water lines for fire protection.

Contract let for service water system.

Rich loam from Sacramento Valley, 6,000 cubic yards, unloaded at grounds for shrubbery and plants.

Contracts awarded for erection of ferry slips, hydraulic plant and steel apron.

Contracts awarded for grading for Machinery Hall and its construction.

Contract let for construction of sewers in main roadway of concession district.

Construction of sunken gardens more than half completed.

Contract awarded for grading for Automobile Building.

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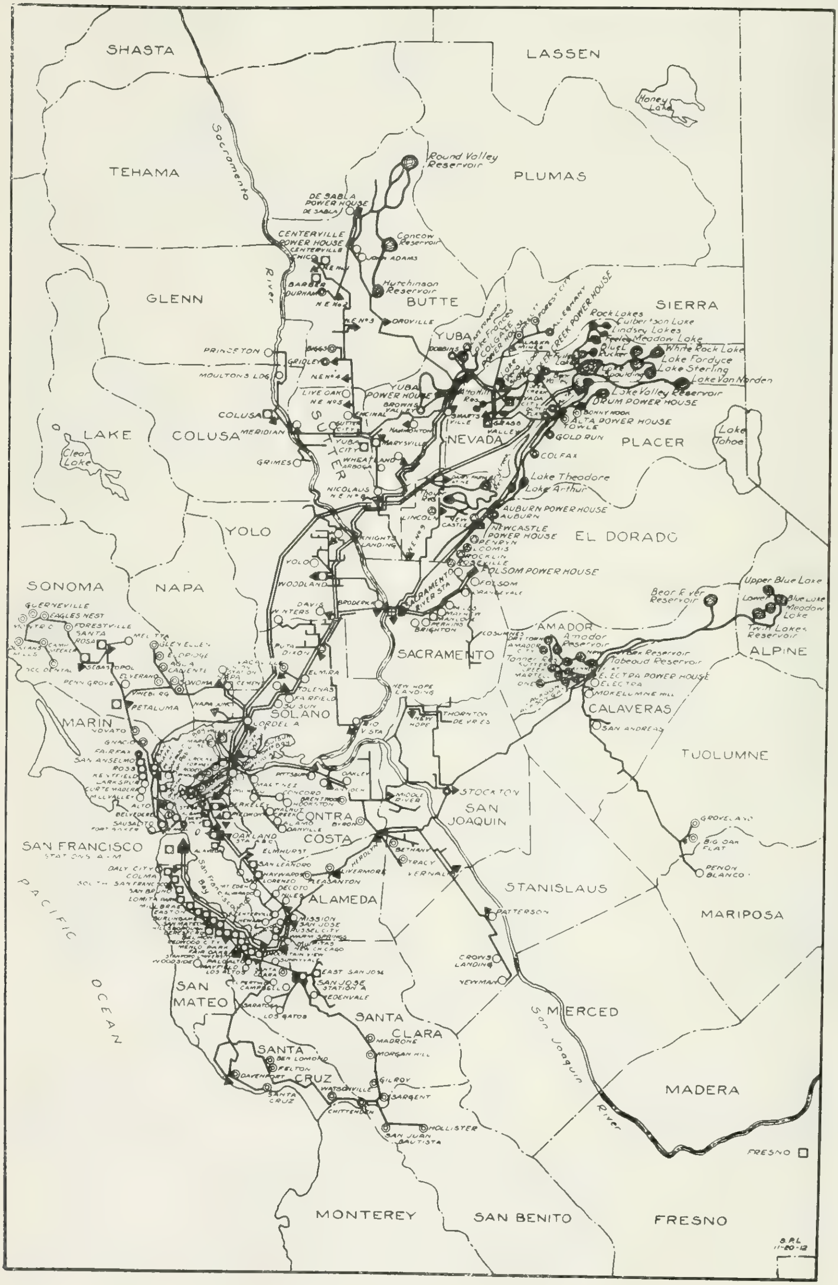
SHASTA
LASSEN
Honey Lake
TEHAMA
Sacramento River
Round Valley Reservoir
PLUMAS
DE SABLA POWER HOUSE
CENTERVILLE POWER HOUSE
CHICO
Concow Reservoir
Hutchinson Reservoir
GLENN
BUTTE
OROVILLE
SIERRA
Rock Lakes
Culbertson Lake
Lindsey Lakes
Meadow Lake
White Rock Lake
Lake Fordyce
Lake Sterling
Lake Van Norden
Lake Spaulding
Lake Valley Reservoir
DRUM POWER HOUSE
ALTA POWER HOUSE
YUBA
YUBA POWER HOUSE
COLGATE POWER HOUSE
PRINCETON
GRIDLEY
LIVE OAK
COLUSA
MERIDIAN
SUTTER
MARYSVILLE
YUBA CITY
WHEATLAND
NEVADA
GRASS VALLEY
GOLD RUN
COLFAX
PLACER
Lake Tahoe
LAKE
Clear Lake
COLUSA
GRIMES
NICOLAUS
Lake Theodore
Lake Arthur
AUBURN POWER HOUSE
AUBURN
LINCOLN
NEWCASTLE POWER HOUSE
PENRYN
LOOMIS
ROCKLIN
ROSEVILLE
EL DORADO
YOLO
KNIGHTS LANDING
WOODLAND
FOLSOM POWER HOUSE
FOLSOM
SONOMA
NAPA
DAVIS
WINTERS
BRODERICK
SACRAMENTO RIVER STA
Bear River Reservoir
Upper Blue Lake
Lower Blue Lake
Meadow Lake
Twin Lakes Reservoir
ALPINE
GUERNEVILLE
EAGLES NEST
FORESTVILLE
SANTA ROSA
SEBASTOPOL
PENN GROVE
PETALUMA
GLEN ELLEN
SONOMA
DIXON
ELMIRA
VACAVILLE
SACRAMENTO
AMADOR
Amador Reservoir
Tabeaud Reservoir
ELECTRA POWER HOUSE
ELECTRA
MOKELUMNE HILL
CALAVERAS
SAN ANDREAS
SUISUN
FAIRFIELD
SOLANO
CORDELIA
NAPA
MARIN
NOVATO
SAN RAFAEL
FAIRFAX
SAN ANSELMO
ROSS
KENTFIELD
LARKSPUR
CORTE MADERA
MILL VALLEY
SAUSALITO
BELVEDERE
BENICIA
RIO VISTA
NEW HOPE
THORNTON
TUOLUMNE
PITTSBURG
ANTIOCH
OAKLEY
CONCORD
WALNUT CREEK
CONTRA COSTA
BERKELEY
OAKLAND
BYRON
STOCKTON
SAN JOAQUIN
SAN FRANCISCO
STATIONS A-M
ALAMEDA
SAN LEANDRO
HAYWARDS
LIVERMORE
PLEASANTON
TRACY
VERNALIS
BETHANY
GROVELAND
BIG OAK FLAT
PENON BLANCO
DALY CITY
COLMA
SOUTH SAN FRANCISCO
SAN BRUNO
SAN MATEO
BURLINGAME
REDWOOD CITY
MENLO PARK
PALO ALTO
NILES
DECOTO
MISSION SAN JOSE
STANISLAUS
PATTERSON
MARIPOSA
PACIFIC OCEAN
San Francisco Bay
SAN JOSE
EAST SAN JOSE
SANTA CLARA
CAMPBELL
LOS GATOS
SARATOGA
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San Joaquin River
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FRESNO
MONTEREY
SAN BENITO
FRESNO
S.R.L. 11-20-12

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,800 people.
OPERATES 11 hydro-electric plants in the mountains.
5 steam-driven electric plants in big cities.
16 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,775 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

Ask your "Tough" problem

to write HARDY.

He has a way that will pay
the Consumer and the Power
Company as well.

C. E. HARDY
165 Second St.
San Francisco, Cal.

VOL. 4 APRIL 1913 Nº 11

Pacific Service Magazine

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SAN FRANCISCO, CALIFORNIA

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San Francisco

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J. G. White Engineering Corporation

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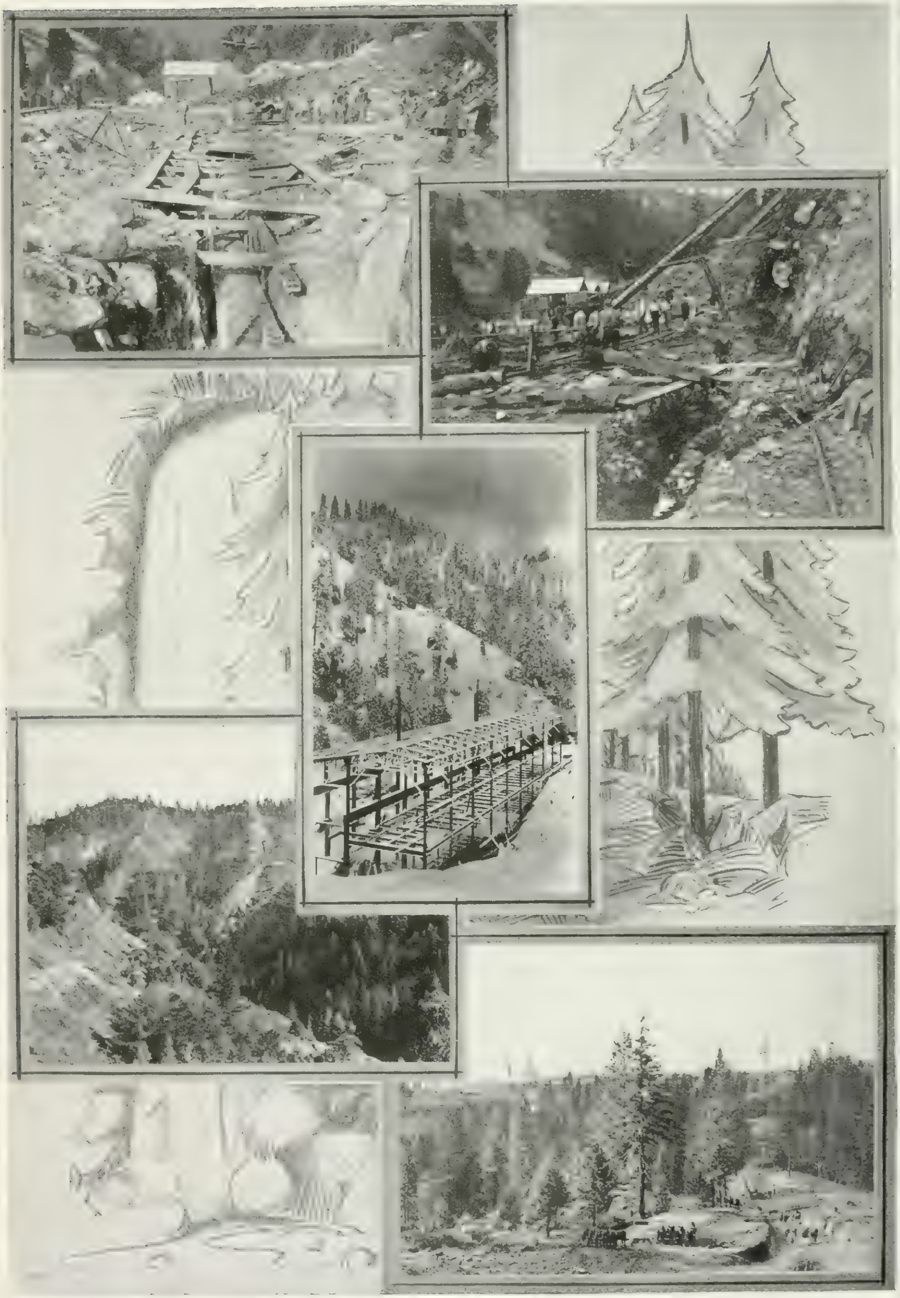


Our work at Drum Power House. The central picture is of the power house as it looks today. The view at the upper left looks north along the foundation line from the southwest corner of the power house, the companion view is taken from the southeast corner. The lower views show (left) tram line and trail to the power house; (right) work on syphon connecting canal with forebay.

PACIFIC SERVICE MAGAZINE

VOL. IV APRIL 1913 No. 11

The First Season's Work at the Drum Power House

By J. F. POLLARD, Electrical Construction Department.

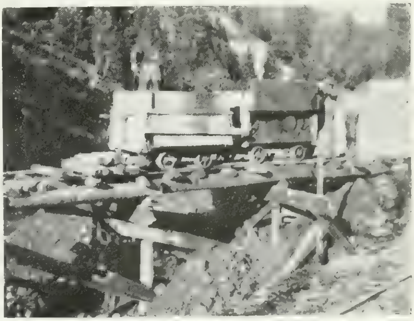
J. F. Pollard

The Drum Power House, when completed, will utilize the head waters of the South Fork of the Yuba River. It will develop thereby 40,000 kilowatts at 80% power factor or about 53,300 horsepower, in electrical energy. These waters will be delivered through the Drum Canal from the storage reservoir, created by the Lake Spaulding dam; both of which are now in the course of construction and have been described in former editions of this magazine.

The water wheels will work under a head of 1,370 feet and the total average supply of water available is estimated at about 350 second feet throughout the year.

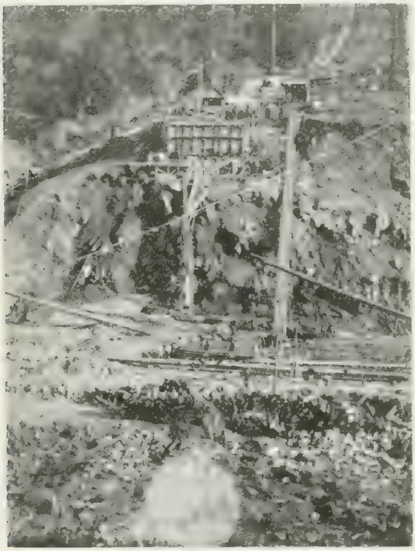
In selecting a site for the building to house this machinery, several features had to be taken into account. First the power house location depends largely on the availability of a suitable site for a forebay, or balancing pond, located at the end of the canal and at the head of the pressure pipe line. This takes care of the fluctuations between water supply and electrical load. It also insures continuity of service at any time the canal is under repairs. It should be probably large enough to store water sufficient for one day's run, though this is a matter open to discussion. In the case of the Drum development, the forebay will have a capacity of 400 acre feet or 17,424,000 cubic feet, which is equivalent to a flow of 350 second feet for about 14 hours.

Power house camp from across Bear River



Dump cars discharging load

The second consideration is a suitable location of the penstock or pressure pipe, which delivers the water from the forebay to the power house. The length of the pipe must be as short as possible and yet give the greatest obtainable vertical drop.


Crusher and mixing plant at power house site

The third point to be considered in locating the power house is the fact that it must be placed where the foundations can be prepared without an excess of excavation, and where if possible, it can be built on bed rock.

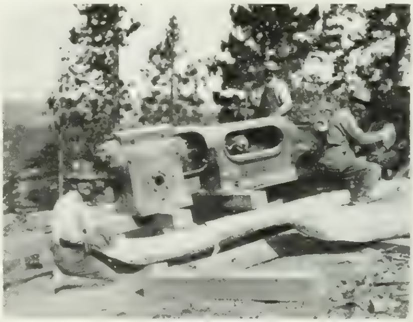
In the final selection of a site all these factors were considered: the forebay was scraped out of the top af a gently sloping hill, such that the elevation of the high water level is 4,622.00 feet; the pipe line is so located that its total length in horizontal projection is 5,958.37 feet carrying the water to the nozzles at an elevation of 3,250.7 feet. The total vertical drop or gross head being 1,371.3 feet when the reservoir is full. The pitch is as steep as 38 degrees in some places.

The building is on the southeast bank of the Bear River, about twelve miles above the point where that stream is crossed by the Nevada County Narrow Gauge Railroad. It is just above the confluence of a small tributary creek with the river. This, however, provided but a very small portion of the flat necessary for the foundations.

The factor of keeping the necessary excavation quantities as low as possible was the most troublesome, as the sides of the canyon of the Bear River are very steep, due to the fact that it is a typical Sierra stream, having a steep gradient and in high water season a very turbulent flow.

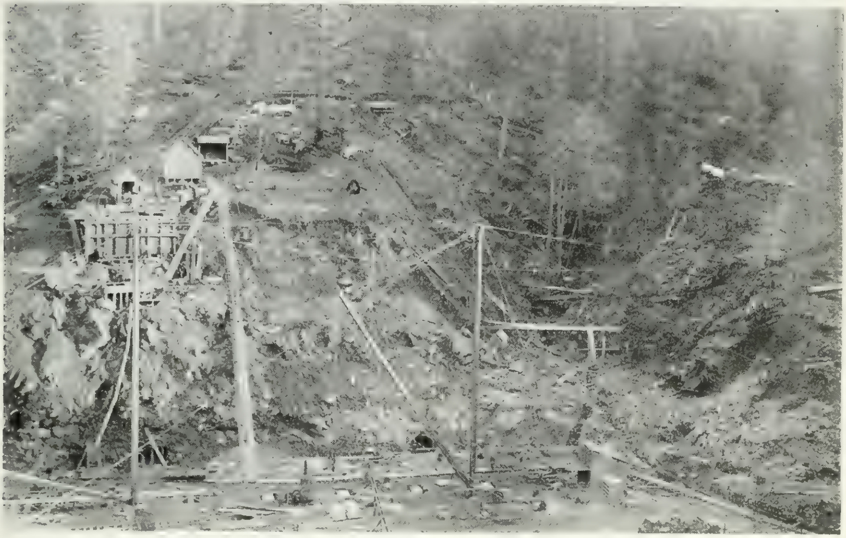
The general character of the bed rock, in the immediate vicinity of the power house, is what is commonly called serpentine. This is a substance composed mainly of silica, magnesia and a little protoxyd of iron. It is green in color. When it is cut away and left standing at a steep slope, it flakes off in large masses. The surfaces of these have a high natural polish. Serpentine sometimes occurs as the fibrous chrysotile, which is popularly called asbestos; a few small specimens of which were picked up during the excavation.

At the back of the power house this bed rock rises to the height of about twelve to fifteen feet above the floor level and slopes from this elevation to the floor level on the


Cne-half of the compressor at the top of the hill being fastened to skids for transportation to power house

river side. From there it seems to pitch off almost vertically. This proved to be a determining feature in the final exact location of the building. At first it was thought desirable to face the power house as nearly down stream as possible, so that the discharge from the nozzles would be thrown down the river and would not undermine the opposite bank, which rises at a very steep angle from the water's edge and is of a shaley, slaty formation. Accordingly the first location of the power house was made with the long front side at a considerable angle to the general direction of the stream. A test trench was sunk along the line of the front wall to a depth of sixteen feet without striking bed rock, at the upstream end of the building. And it was not until this corner was swung back to a distance of about a hundred feet from the water, that bed rock was found as high as the floor level, showing that the bed rock pitched off more than sixteen feet, within a distance of about forty feet, at this point. Bringing this corner back so far made the building as finally located practically parallel to the general direction of the river.

The bed rock as it has been described was not bare however, but lay under a large deposit of gravel and earth, left by a moraine in the glacial period. This hill like the slaty formation on the other side rose very precipitously from a point close to the water's edge. About 50,000 yards had to be excavated and removed before the bed rock was cleared and ready to receive the building's foundations.



General view of power house site from across Bear River

First a large portion was removed by means of the hydraulic monitor a relic of the early placer mines, the operation of which was described in an earlier issue of this magazine.

It was found impossible to move all the material by this means, however, as many of the boulders encountered were of such size that the monitor, working under the available head of 200 feet, was unable to move them. One can readily understand why, when it is stated that the largest of these weighed approximately 150 tons. Therefore, after the

Portal of Tunnel No. 1 at power house site

monitor had removed all the surface material and all other that it was capable of handling, a large force of miners and about two car loads of powder were employed, and the moraine, which consisted of a very hard cemented mixture of sand rock and gravel, much like a natural concrete, was gradually blasted away. The material was shoveled into push cars each of which was propelled to the dump by two men. Side dump cars, built on the job, were used. They simply consisted of two pairs of twelve-inch wheels with 1½-inch square axles, 30-inch gauge, upon which a box was set, having a bottom of two-inch planks, sloping both ways from the center. Each side hung from a steel rod run along the top and swung from the ends of the car. They were designed to hold a yard when level full, and later when the work was more rushed in preparation for the winter season the sides were raised to increase the capacity to a yard and a half.

One of the big difficulties was to find a place in this narrow canyon to waste all this material without obstructing the stream flow. This was accomplished by running the tracks for the dump cars along the same side of the river as the power house and on a slight down grade from its floor level. They were carried on rough trestles, built from timber, cut in the immediate vicinity. The cars were run out on these trestles and dumped from either side until the dump was raised to the level of the track. The tracks were extended as the dump grew until they ran to a distance of between two and three hundred yards down the river. Of course the dump increased rapidly in height, the further down the river it was carried, as the natural grade of the stream is very steep. In this way by filling up about half of the canyon all the waste material that could not be utilized, was taken care of, leaving the other half for the river bed.

The cemented gravel mentioned above contained a great deal of earth and quartz which had to be wasted, but it also contained many granite boulders. This granite material was not carried out to the dump but was laid to one side and after being drilled with jap drills and broken with dynamite was carried to an eminence behind the power house and about seventy feet above it, by means of a narrow gauge tramway, operated with a small compressed air hoist and one-half inch steel cable.

At the top of this hill a motor driven, Fort Wayne, jaw crusher was installed. Here the granite was broken up into sizes small enough for concrete aggregate. It dropped into a large hopper or rock bin, immediately below the crusher, ready for use in making the concrete foundation piers for the columns of the building.

Adjacent to the rock bins and at the same elevation a sand bin was placed. Sand was shipped in to Drum from Spaulding over the Southern Pacific Railroad and the Company's Orel spur, and was delivered to the power house bunkers over the main broad gauge tram which is operated by gravity and controlled by an electrically operated hoist. These tram cars are of the side dump type and run out over the bins to discharge their loads. A similar arrangement is made to supply crushed rock and gravel, when a sufficient quantity is not obtainable from the crusher. The rock bin is of about forty yards capacity and the sand bin half that size. Immediately below these bunkers, on a platform so constructed that it can be supplied from them by gravity chutes, a Smith rotary concrete mixer of 11 cubic feet capacity was installed. It is geared to a small induction motor and is equipped with compensator and starting box.

The concrete after being mixed is run to the level of the foundations through a ten inch riveted steel pipe, a part of the same which was used to supply the hydraulic monitor with water in the earlier work of excavation. At the lower end of the pipe, a small hopper with a capacity of one yard, was placed, whence the mix was drawn off in two wheeled buggies and distributed to the various parts of the plant. When everything runs smoothly and without mishap, the mixing outfit will turn out an average of a batch every two minutes or 330 cubic feet an hour or about 110 yards

Excavation on pit at Canyon Creek Spur at foot of tramway line.

in a nine hour day. Such ideal conditions don't work out in practice and the best the plant has done is about 80 yards.

The first piece of machinery installed was a Joshua Hendy, double stage air compressor belted to a 100 horsepower electric induction motor. This supplied compressed air at 120 pounds pressure for use in running the machine drills for blasting, the small hoist that served the crusher plant, the air guns used in riveting the steel frame of the building, and for blowing the smoke out of the tunnels after a round of blasts. This heavy machinery was let down the hillside on rough skids and snubbed from tree to tree with ropes, being transported thus before the main tramway was completed.

The foundations were all completed and the steel frame of the building erected and riveted before the winter storms made it necessary to shut down the work. Upon the advent of more favorable weather in the spring the penstock line will be constructed, the concreteing of the building completed and a part at least of the machinery installed, ready for operation next fall.

The Path the Calf Made

By SAMUEL WALTER FOSS.

One day, through the primeval wood,
A calf walked home, as good calves should,
But made a trail all bent askew—
A crooked trail, as all calves do.
Since then two hundred years have fled,
And, I infer, the calf is dead;
But still he left behind his trail—
And thereby hangs a mortal tale.
The trail was taken up next day
By a lone dog that passed that way,
And then a wise bell-wether sheep
Pursued the trail o'er vale and steep,
And drew the flock behind him, too,
As good bell-wethers always do.
And from that day, o'er hill and glade,
Through those old woods a path was made,
And many men wound in and out
And dodged and turned and bent about,
And uttered words of righteous wrath
Because 'twas such a crooked path;
But still they followed—do not laugh—
The first migration of that calf,
And through the winding woodway stalked
Because he wobbled when he walked.
This forest path became a lane
That bent and turned and turned again;
This crooked lane became a road
Where many a poor horse, with his load,
Toiled on beneath the burning sun
And traveled some three miles in one;
And thus a century and a half
They trod the footsteps of that calf.

The years passed on in swiftness fleet,
The road became a village street;
And this, before men were aware,
A city's crowded thoroughfare.
And soon the central street was this
Of a renowned metropolis.
And men two centuries and a half
Trod in the footsteps of that calf,
Each day a hundred thousand rout
Followed the zigzag calf about;
And o'er his crooked journey went
The traffic of a continent.
A hundred thousand men were led
By one calf near three centuries dead.
They followed still his crooked way,
And lost one hundred years a day;
For such high reverence is lent
To well established precedent.

Washington's Birthday in the Snows

How a Company of Fifty Business Men, Organized as "Pacific Boosters," Enjoyed the Holiday at Lake Spaulding

An unusual Washington's Birthday experience for residents of sunny California was that enjoyed by a party of fifty business men of San Francisco who took occasion to visit the scene of our new developments in the high Sierras.

They were, for the most part, representatives of prominent gas and electric appliance houses in San Francisco, and through the courtesy of the Pacific Gas and Electric Company they were enabled to view the site of the big dam which the company is erecting at Lake Spaulding. The excursion was styled the "Pacific Boosters' Trip to see the Dam Site at Smart, Placer County, California." A special train was engaged, consisting of two Pullman sleepers, diner, parlor, observation and baggage cars, and the departure from San Francisco was made at 9:40 p. m. on Friday, February 21st. Smart, the little station in the snow-sheds from which the Pacific Gas and Electric Company runs a branch railroad to Lake Spaulding, was reached early Saturday morning and the whole party arrived at Spaulding Camp in time for breakfast.

There was a foot or two of snow up there but all had been warned in time and arctic snow shoes overcame that little difficulty. The weather was clear, crisp and invigorating. After breakfast the visitors were taken to the site of the dam by George Burnside, foreman of Spaulding Camp, and shown the wonderful construction work that was begun before the snows came and will be taken up again as soon as they disappear. They were shown also the mile long tunnel which is being bored through the rock leading from the dam and 3,000 feet of which has been completed. After inspecting the construction work

On Lake Spaulding—A suspicious cracking sound precipitates a rush for shore and safety

Toiling back to camp.—A trying tramp through the snow

to their hearts' content the party took to climbing up the surrounding eminences and, being full of good spirits, got up an impromptu snow-balling match which was enjoyed because it afforded all an unusual experience. The party returned to the camp for lunch and afterward went down to the lake where they tried the ice and had their pictures taken. They were also initiated into the mysteries of sleigh-riding and skiing.

Then they walked back over the snow (no easy matter at this time of the year) and were entertained at dinner, after which they returned to Smart and boarded the train for Truckee.

At the latter place the Ice Carnival and winter sports were in full progress and the Pacific Boosters joined the members of the Sierra Club in various games and exercises. Some of them visited Donner Lake nearby. The return home was made Sunday night and the excursionists held an entertainment on the train which was voted a great success. All were enthusiastic in their expressions of satisfaction over their unique experience.

Charles D. Steiger of the Steiger and Kerr Stove and Foundry Company, acted as spokesman for the party when he said:

"At Lake Spaulding we were treated to one of the greatest sights we had ever seen in our lives. We can imagine nothing more gorgeous than the view we had up there in the high Sierras. We admired the construction work in progress there immensely and for the first time we were able to gain some realization of what a stupendous undertaking the Pacific Gas and Electric Company has on hand.

"We cannot speak too highly of the courtesies extended to us by the company. The camp fare was excellent and abundant and the fresh air gave us the appetites to enjoy it. Taking it all in all it was one of the most successful trips of the kind I have ever experienced."

John H. Hunt, Purchasing Agent of the Pacific Gas and Electric Company, went along with the party to do the necessary honors en route and with him were three of his subordinates, C. E. Murphy, Ed Mahoney and George Williams. The names of the boosters' delegation follow:

C. C. Beatie, Pacific Hardware & Steel Co.; C. D. Steiger, Steiger & Kerr Stove & Fdy. Co.; J. E. Crilly, Holabird-Reynolds Co.; D. E. Harris, Pacific States Electric Co.; C. E. Murphy, Pacific Gas and Electric Co.; J. H. Hunt, Pacific Gas and Electric Co.; R. McIntyre, Moran Co.; W. L. Neelands, Western Electric Co.; E. H. Coleman, Greenebaum, Weil & Michaels; L. Fitzpatrick, Brittain & Co.; J. E. Brandon, Martin-Camm Co.; T. Haskins, Leege & Haskins; H. Heitmuller, C. W. Marwedel; L. Fotreau, Goodyear Rubber Co.; P. T. Sprague, P. T. Sprague & Co.; D. Davis, Dodge-Sweeney & Co.; M. Blum, Levi-Strauss & Co.; G. S. Scheer, Scheer, Grandi & Co.; E. A. DeLue, L. R. Larzelere & Co.; X. Wolbach, Haas Bros.; J. Francisco, Gorham-Revere Rubber Co.; H. Stratford, Payot-Stratford & Kerr; W. Leahy, Fisher Packing Co.; F. McGovern, Judson Mfg. Co.; G. I. Williams, Jr.; Pacific Gas & Electric Co.; C. Elsasser, Mark-Lally Co.; N. H. Wear, Jones-Theirbach Co.; R. B. Swayne, R. B. Swayne & Co.; H. S. Norman, Firth, Sterling Steel Co.; W. R. Dunbar, Westinghouse Elec. & Mfg. Co.; C. L. Wooll, Harron, Rickard & McCone; R. W. Martindale, United States Pipe Co.; S. Gilman, John A. Roebling's Sons Co.; H. B. Mills, Rolph, Mills Co.; L. R. Edwards, Parrott & Co.; E. G. deWald, Pierson, Roeding & Co.; J. G. Reid, Pierson, Roeding & Co.; J. R. Thompson, H. W. Johns-Manville Co.; T. F. Leary, H. Mueller Mfg. Co.; D. T. Blair, Eccles & Smith Co.; C. A. Lumb, Alpine Evaporated Milk Co.; F. Pierce, Plant Rubber & Supply Co.; G. Muir, Muir & Symon; L. A. Nott, Standard Underground Cable Co.; N. E. Otterson, Chicago Pneumatic Tool Co.; W. E. Mushet, W. E. Mushet & Co.; Geo. D. Monaghan, John A. Roebling's Sons Co.; E. O. Mahoney, Pacific Gas & Electric Co.; G. Murphy, United Art Glass Works.

Shortly after their return our guests expressed their appreciation of the courtesies extended to them in the following communication to Mr. Britton:

Snowballing was indulged in

A winter view of the Lake

Mr. John A. Britton,

Vice-Pres. and Genl. Manager,

Pacific Gas and Electric Co.

Dear Sir:—On behalf of the party composed of "Pacific Boosters," who made the trip to the scene of development work at Lake Spaulding on February 21st., it is our desire at this time to thank you most cordially for the consideration and hospitality shown us by the Pacific Gas and Electric Co. while viewing this wonderful work.

It is the intention to perpetuate the name of "Pacific Boosters" to the end that each and every individual member of this club can be counted on at all times as a loyal Booster for the Pacific Gas and Electric Co., and "Pacific Service."

Thanking you again for the treatment accorded us by both your good self and the "Men on the job," wish to remain

Yours respectfully,

The Committee.

The Mascot of Little Bear

By RUDOLPH W. VAN NORDEN

(Copyright, 1913, by Rudolph W. Van Norden.)

This little story is a reminiscence of one of the many unrecorded happenings which, through the powerful hold of human sentiment, casts a strong influence over the imagination and serves to add the spice and charm to the prosaic things of life which make their memory an unending joy.

The Alta power plant was built in 1902. *The generators and machinery were contracted for in December* 1901. *Work was commenced sluicing off the surface soil from the underlying bedrock, on April* 15*th,* 1902. *Current was turned into the transmission line and delivered to Sacramento, at* 3:00 *P. M. on Nov. 7th.,* 1902.

The plant is located on Little Bear Creek, a branch of Bear River, and about two miles east of the old town of Dutch Flat.

If he ever had any name but just "Dutch", no one knew what it was. At any rate he seemed perfectly well satisfied with it. Tom Burney said he was only a tramp, he certainly had no home anywhere around the diggin's, and Tom's opinion was worthy of consideration because Tom had lived at the Flat as long as he or anyone else could remember.

Dutch Flat had been pretty quiet for twenty years or more, ever since hydraulic mining had been prohibited by law, because the debris from the diggin's was washed down and filled the rivers in the Valley and the Upper Bay. There were two or three saloons that still eked out an existence by the occasional catering, principally to the chance traveler, but were indispensable as the common meeting place where the men folks discussed politics, or more often told of the old days of easy gold in the diggin's. Of these, the Blue Gravel saloon was by far the most important. Here one might find an occasional visitor of distinction, and here one always went for good "liker".

Tom Burney never had the name of being much of a drinker, but he went to the Blue Gravel once a day to get the latest gossip and Tom said that he could not remember the time when Dutch was not kicking around the saloon. Tom had no idea about his nationality and Dutch would never talk about himself.

Dutch knew every one at the Flat, that was freely admitted, and he disliked them all. But he tolerated anybody and did not hesitate to invite himself wherever his presence might be conspicuous.

When the work commenced on the power house up Little Bear Creek,* about all of the able bodied men at the Flat were employed on the job and Tom Burney, like the rest, started out every morning on the trail up the gulch and returned every evening. Dutch was not invited but he could hear the muffled boom of the blasting, and nothing stirred his blood to action or disturbed his dignified repose so much as the sound of blasting.

Dutch knew he was needed and after a few days of careful consideration, he joined the boys one morning as they started for the trail.

On the job, he took charge of blasting operations, which kept him pretty busy, because he insisted on inspecting the work between the time of lighting the fuse and the explosion. That is, he would stand as close to the sputtering fuse as the smoke and sparks would permit. And during this brief period he had a lot to say.

Ordinarily Dutch would not ruffle his dignity by rapid movements. He always walked unless positively urged, and, for this reason he was sometimes thrown around pretty roughly. He believed that a careful inspection of a lighted fuse was a solemn duty, and Dutch had a love of duty that was implacable. He suffered a little discomfiture anyway because he had been kicked around ever since he could remember. More than once he has walked slowly into headquarters, after the last report of a round of blasts, his long, tow-colored towseled hair sticking out from his head in every direction but the right one, and caked with mud which pretty well disguised his unkempt tramp's countenance.

His importance was supreme; his contempt for the boys was evidenced in every look and movement. He would walk around the job looking neither right nor left, but one eye was always cocked up and on the alert. Long experience had taught him to be ready to miss the toe of an unsympathetic boot.

Poor old Dutch, with all of his seriousness and importance was never fully appreciated. He was too homely and too much of a tramp to be noticed. But then, who would expect to take him seriously, Dutch was only a dog.

When I say he always walked, I mean that that was one of his many peculiarities, the boys all agreed he was too lazy to transport himself otherwise. And it was a funny stiff legged walk and he had a tail about two inches long that was likewise stiff and this moved diagonally back and forth in strict unison with his step. He could trot when he had to, to keep up, of course, but at the cry of "Fire", his little muscular body was galvanized into a rapidity of movement that respected neither brush or boulders and so far as one could tell, he might have been propelled from some unseen catapault.

There were other dogs on the job, but they were just ordinary dogs who followed their masters to and from their work. There was nothing ordinary about Dutch, he was too ugly, too self-possessed and generally too dirty and he had no master and didn't need one. He believed that his presence on the job was necessary, but he made no friends, at least, nobody took the trouble to find out. He was never in the way, because he knew from bitter experience what that meant, but if anything of particular interest was happening, Dutch was there at the best point of vantage, where he could observe and be observed.

The noon whistle had sounded one day and was immediately followed by the familiar call from down the gulch of "Fire". As the boys gathered in groups with their lunch pails, under a friendly tree across the canyon, or in the shade of the tool house, not a few, including the Boss stopped to observe the effect of the blast. Dutch needed no second invitation and there were a few glimpses of him as he emerged from behind a rock or a bunch of chaparral like the frayed end of a taut rope which had given away. And then came the dull boom, followed by the splitting spatter of flying rock and earth into the nearby brush and the enveloping cloud of dust which would gradually fade away as the rocks thrown farthest plumped through the trees far up the side of the gulch. But amid that cloud,—there could be no mistaking the animate bunch of yellow tow, destined to land somewhere across the gulch, was Dutch.

"I always knew he would get 'his', sometime; he was too damn smart; but someone might have thought to lock him in the tool house before they hollered 'fire' ". It was Tom Burney who spoke and the boys seemed to be willing to let it go at that.

The lunch was rather quiet, there was nothing much to talk about, two or three of the common dogs were all attention to catch the scraps that might be thrown their way. Nobody had been in the habit of feeding Dutch, he had no master and he looked out for himself. And then something happened: The boys jumped to their feet as one man, for there was Dutch coming across the bridge, his slow measured step not in the least disturbed, the two-inch stump of a tail moving in stiff unison with his stride, one eye straight ahead, the other a little cocked for the boot he had learned to expect, the rope-end fur unkempt and ruffled and his muzzle a little dirtier than usual. So far as he was concerned, nothing unusual had occurred. He was thoroughly satisfied with himself, for, had he not superintended a very successful blast?

The boys all knew that Dutch was different, but the Boss was sure of it and he went over to where Dutch had quietly settled himself into the coal box on the steam hoist. For a moment the Boss looked at him and those beady black eyes looked straight back, and they both understood. Dutch at last had a friend, and he was sure of it when he was given more dinner than he had lawfully received for many a day.

By this time the boys were all discussing the blast and the luck that seemed to follow the little canine waif, and Tom Burney predicted that as long as Dutch would stay on the job, so long would there be no accidents, that he was their mascot. Everyone seemed to agree with this sentiment.

The Boss lived in a tent, far up the hillside above the powerhouse, and that night when he reached the tent he found Dutch there first, in fact he was asleep just outside the flap. How he got there or how he knew where to go, Dutch alone could explain.

CHAPTER II.

Dutch had changed his mode of living, he seemed to have forgotten the saloon at the Flat, and every night and morning he and the Boss went and came from the work. He was fed well and he had a good bed just outside of the tent, and whenever the Boss spoke to him or called him, his response was immediate. His little cold nose would rest on the Boss' knee and the little black beads of his eyes would peer straight up at him from under the yellow mat of coarse hair, the stump of a tail giving an occasional wiggle as he was spoken to.

In the days that followed, as the work on the powerhouse progressed and form began to appear out of a chaos, and the heavy machinery was hauled in load after load to be placed in position in the big basalt building, the Boss was a very busy man. But wherever he might be, Dutch was never very far away. If his master was working at his desk in the tool house, Dutch was asleep near him,—not with one weather eye open, as it had long been necessary for him to sleep, but with fullest confidence in the knowledge that his friend would never allow an abuse.

The weeks went by thus, until in the evenings when they reached the tent it was almost dark, the clear hot skies of summer were now occasionally overcast with great white clouds which at the end of the shortening days resolved their myriad forms into glorious pink, green and lavender sunsets, and the mornings were cool, and the boys began to appear on the job with reefer coats over their jumpers. And the smoke from the hoist would curl and twist as a gust, now and then, would come down the gulch, scattering the brown cloud across it and then far up among the nodding pines.

One morning, early in October, dull clouds gave promise of the first real rain, and the day was spent at the powerhouse in getting everything under cover that might be damaged by water. It was a busy day for all hands. The Boss was perhaps a bit irritable when Dutch seemed to get in the way. Early in the afternoon the rain came, at first a gentle drizzle, but finally settling into a steady downpour.

At quitting time the boys were tired and the thought of the long two mile tramp over the trail, down the gulch to the Flat, or through the woods to the camps, with the certainty of a thorough wetting, was not pleasant. The Boss made his way through the wet cedar saplings and tan-oak thickets as rapidly as his horse would carry him. The trail seemed dark and cold, and when the light of the camp shone through a clump of second-growth sugar pine, he thought only of the hot supper, and he dug his heels into his horse's flank a little harder than was necessary.

From the stable, he went straight to the kitchen stove and a few minutes later to his supper and then perhaps an hour was spent discussing the rain and the probability of a good water season. Then he went, or rather, ran, to his tent, for it was raining as if the whole season's downpour was to be precipitated in that one night.

The Boss dove through the flaps of the tent and made for the coal-oil lamp which was on the small reading table by the head of his cot-bed. As the light gradually came to its full brilliancy, the Boss looking around over his shoulder, gazed for a moment at his bed, an expression of amazement not unmixed with disgust, but slowly and skillfully punctuated with a few choice phrases. There, settled squarely on the pillow, curled into a ball that looked for all the world like the last turn of a ship's hawser which had become unravelled just after it had been hauled aboard from trailing in the water, was Dutch. He had been asleep andwas thoroughly comfortable. Dutch had never done such a thing before, his bed was outside and he never came in the tent. Of course it had not rained before. But this was too much. The Boss just picked him up by the scruff of his wet neck and told him plainly that he could lie in a corner but not on the bed. If Dutch understood this fine distinction he had no intention of heeding it. For a moment he stood as if in doubt, then turning slowly around, gave one short yelp, walked to the flap and slid under into the darkness.

The Boss rearranged his bed, and then he made a bed for the dog where he would be sheltered. He opened the flap and called; again and again he called into the blackness and wet, but there was no response.

Before the eventful day of the big blast when he and the Boss became pardners, Dutch had known no friend. His faith in humanity had been thoroughly dulled through many sad experiences, and, at last, when a friend and protector appeared everything was so different for him. His sense of security became so great, it seemed that nothing he could do would be wrong. Had the Boss not given him all that he might wish for? Had he not protected him at all times? Why should he do otherwise now? When the rain came and his bed was wet and cold, would the Boss not take care of him? There was no room for doubt in fact, if the Boss were there, he would make him a good bed under shelter. Dogs certainly seem able to think; if that be true then these were the thoughts in his busy little head,—who knows? So Dutch had just gone into the tent and there he found a bed soft and warm. The Boss had always provided things he had never dreamed of before, he had but to help himself in such an emergency. Dutch's faith was as perfect in this one man as had been his suspicions of all others. And then the little monument of his happiness had fallen about his ears like a house of cards. After all the Boss was not very different from the rest. He had at last awakened from a dream and there was nothing now but the old life of a tramp. And Dutch pattered along the muddy road, through the dark and the storm for the old corner in the Blue Gravel saloon at the Flat.

CHAPTER III.

It was not until the noon whistle the next day called the boys to their lunches that the Boss found the little extra lunch which he had always had provided since the beginning of his friendship, had no claimant, and then he asked a number of the boys if they had seen his dog on the job that day. But Dutch was not on the job for the first time since the ground was sluiced out to make ready for the foundations of the powerhouse.

Day after day passed until October was gone, but every day the Boss asked someone if they had seen Dutch, and every day Tom Burney with several others would visit the Blue Gravel saloon for no other reason than to see if Dutch had stopped in. It wasn't a matter of any importance, of course, because Dutch was only a yellow dog, "But the Boss seemed to like him and they wanted to please the Boss," Tom explained. Dutch had disappeared as if his former arrogance only intensified his shame at being cast out and made fun of.

November came and work was being rushed on the powerhouse; the big generators were in place and the maze of wiring was almost completed and the finishing connections on the heavy pipe lines to the water wheels were being made by the boilermakers. But a few days remained before water would be turned in, and the power lines which would supply energy for driving mine hoists and compressors, and light homes and run railroads in the valley miles and miles away, were completed and tied in.

All was excitement. The boys made all sorts of predictions about the way she would start, but Tom Burney was uneasy and one day at noon, during a discussion of this sort, Tom made the irrelevant remark that nobody at the Flat had seen Dutch since the day the rain started.

Then the great day came: The telephone had been very busy as the engineers tested out the lines and circuits. Everything was in readiness and 3:00 P. M. was announced as the time when No. 1 generator would come on the line.

For the twentieth time the Boss inspected everything from wires to pressure gauges. The transmission lines had been finally tried out and the transformers cut in. The exciters had been turning over for several days and everything had been cleaned up about the power house. The operators were ready for their duties and there were two or three small groups of the boys from the Flat who felt that the success of the powerhouse was as much theirs as any one's else.

The Boss gave a last word over the telephone and took up his position by the big waterwheel casing of No. 1. Before him lay the inert mass of iron, steel and copper, to become for the first time, at a slight movement of his hand, a thing of life, meeting the terrific pounding of the unleashed water to transfer its thousands of horsepower of energy quietly and relentlessly into a form for use in a hundred ways.

The Boss's hand held firmly the lever controlling the hydraulic power gate, and moving it slightly, while his eyes were riveted on the gauges and meters, he waited almost breathlessly for the roar which would accompany the first flood of water into the wheel nozzles.

The attention of all was on the Boss, and as the deep muffled roar began, everyone instinctively stiffened in anticipation of what might come next. The roar grew into an angry howl as the gate slowly opened, not enough water had as yet come through to move the twenty-ton rotor, and then—to a man, everyone turned.

He had entered unnoticed, and, walking in a stiff, slow stride, his short tail keeping strict unison, his tow-colored coat disheveled, his shaggy muzzle dirty, one beady eye straight ahead and the other cocked, ready for trouble, Dutch walked straight up to the switchboard. For a moment he looked up at the bright lights and the shining marble panels, then he turned and looked at the Boss and then he raised his little wet nose as high as his short neck would allow and let out just one long howl.

Dutch had given his final order to start up, his responsibility was finished.

The boys never moved. The Boss had even held the gate where she was for a few moments. Tom Burney's face was the study of a triumph, and as that yelp sounded forth the roar of the water came deeper and louder and the great rotor started on its endless spinning journey. Faster and faster it turned and the fluttering of the synchronizing lamps became slower and slower, and in another few moments she was in.

After the hand shaking and congratulations, it was Tom Burney who remarked that Dutch had walked out just as he had walked in. "I always knew he was the mascot of this here plant," he soliloquized.

A few days later the Boss went to the Flat, presumably on business, and, just to see who was there, stopped in at the Blue Gravel saloon. The usual crowd was there and among those who stood against the bar as the Boss waved a hand which meant a general invitation, was a weary wanderer, a hobo, who would probably leave town when the Blue Gravel became uncongenial as his sole board and lodging place.

"Have any of you boys seen a small tow-colored dog around here lately?" The Boss looked casually into every face and thus spoke as the glasses were being filled. But most of the boys knew Dutch and had been on the lookout, only the hobo seemed ready to impart any information, and remarked as he blew into the suds on the top of his glass: "Yesterday mornin' about daylight I seen the night barkeep kick a yaller dog outen the back door."

The Boss' expression was slightly quizzical as he surveyed, for a moment, the hobo's unkempt features. "Well, here's to Dutch," was his only comment.

* * *

"Pacific Service" Strong on Window Displays

Seldom does a number of Pacific Service Magazine appear without the attention of its readers being called to one or more attractive window displays in district offices up country.

District managers appear to vie with each other in the development of original ideas in this direction and, as a consequence, some novel features are brought to the front.

One window display which is attracting a great deal of attention just now is that at our office in Chico. It consists of a complete pumping installation with an exposed meter which registers the current consumed. The bottom of the window is filled in with soil and a crop of barley planted therein. A neat card states the amount of current used per hour and the amount of water pumped, with estimate of cost.

In the window of our office at Napa is a complete working model of an aeroplane, the machine being operated wtih a motor and battery, the invention of a Napa man. At one time the crowd around the window was so great as to almost obstruct the sidewalk.

There is a very good lamp display in the Santa Rosa office just now. Incidentally, it may be said that all the offices in the interior furnish excellent appliance exhibits in which the various uses to which both gas and electricity may be put for domestic and other purposes are displayed to the very best advantage.

Purification of Coal Gas

A Lecture Delivered at the University of California

By E. C. JONES

E. C. Jones

THIS subject is intended to cover the treatment of coal gas from the hydraulic main to the station meter, and includes condensation, scrubbing and washing, as well as what is strictly termed purification.

The temperature of the retort in which coal is distilled is usually above 2,000° Fah., and the temperature of the gas only a few feet away from the retort is 125° Fah. Five cubic feet of purified gas at normal temperature has a volume equal to about 390 times that of the pound of coal from which it was made. This gas as it leaves the retort in a crude state, is expanded in volume by the vapors of gas liquor and tar, as well as the other impurities removable by purification. The crude gas is also in an expanded condition on account of its temperature above normal. This amounts to 13.2% of its volume for expansion between 60° Fah. normal and 125° Fah. its temperature before entering the hydraulic main.

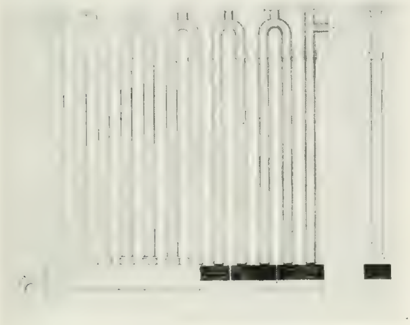
Gas is expanded by heat 1/491.4 for each degree, or about 1% for every five degrees Fah.

Nothing but coke remains in the retorts, so that the hot gas leaving the retort contains all the tar and ammoniacal liquor distilled from the coal and held in suspension in the form of fog and vapor. The amount of these substances so held depends on the heat of the gas, so that when the gas enters the hydraulic main there is a considerable drop in temperature and the heavier portion of the tar and ammoniacal liquor is deposited in the hydraulic main, and in turn flows to the tar well. The piece of apparatus next in sequence to the hydraulic main is the exhauster. This machine is best explained by calling it a rotary gas pump and it performs the double duty of drawing the gas from the hydraulic main, (and it is from this work that it received the name exhauster) relieving the back pressure on the retorts, and at the same time exerts pressure at the outlet to force the gas through the condensors, scrubbers, and purifiers.

It is difficult and quite unsatisfactory to attempt to describe by words the construction of even simple machinery, and reference to diagrams and models will give a much better understanding of gas works apparatus.

The first rotary exhauster was invented by Beale in England, and it was afterwards much improved by P. W. Mackenzie of New York. The Roots exhauster is probably most generally used in gas works of today. This machine consists of two impellers shaped like the figure 8. These are set on parallel shafts at a pitch of 90°, so that one swings within the other, and are enclosed in an iron case with inlet and outlet pipes on opposite sides.

Exhausters are usually operated by steam engines, either direct connected or belt driven. In many gas works the exhauster is located beyond the condensor, but when it is so placed it requires so much lubrication that it becomes a source of trouble. When it is placed between the hydraulic main and the condenser it requires no internal lubrication, and if allowance is made in the construction of the exhauster for expansion, due to pumping hot gas, it works most satisfactorily. The exhauster at this point also performs a certain amount of mechanical scrubbing by breaking up and depositing tar globules. Another and perhaps the best reason for placing the exhauster immediately after the hydraulic main is that all condensing and scrubbing apparatus is operated under pressure. Experience teaches that it is better that gas shall leak out of such apparatus than to have air drawn in.



Early Form of Multitubular Condenser for Coal Gas.

The function of gas condensers is to gradually, and without shock, reduce the temperature of gas to nearly the local normal temperature of the air. In thinking of gas it must not be considered as a fixed chemical substance, but as a physical mixture of gases of different densities. At the hydraulic main every part of the coal, excepting the coke, is in the form of gas heavily charged with water and hydrocarbon vapor. Some of these vapors are deposited in the hydraulic main; and the foul main encircling the retort house, and more of them in the condenser, and the amount of volatile hydrocarbon deposited or remaining in the gas is simply a question of vapor tension due to temperature.

The vapor tension increases with a rise of temperature and decreases with a fall of temperature. The treatment of the gas in the condenser and scrubber should therefore be such that the gas will become stable, and retain its illuminants at local normal temperature. This differs with the seasons of the year and at different latitudes.

The simplest and first form of condenser was a series of upright, round pipes, fitted into a cast iron base and connected at the top by return bends. The base contained partitions extending nearly to the bottom, between each pair of upright pipes. This provided a great length of condensing tubes in a small space, and the condensed tar and ammoniacal liquor flowed downward on the inside surface of the upright pipes into the base and thence to the tar well. Condensation in this apparatus is accomplished by the radiation of heat through the pipes, and is assisted by the frictional scrubbing of the gas on the inside surface of the pipes and in changing its direction of flow through the condenser.

Clegg claimed that "when ordinary vertical iron pipes, radiating in air are used, the portion of the gas in the centre is not brought into contact with the exterior and cannot be effectually cooled." Many new forms of apparatus have grown out of this simple multitubular condenser, some vertical and some horizontal, while others increase the frictional area and length of passage by using flat sinuous tubes in place of round pipes.

Another type of condenser consisted of a series of large upright pipes, one within the other. This was known as the annular condenser. The inner tubes were open to the air at both ends, while the outer tubes were connected together at the top and bottom in regular sequence. The gas passed through the annular space between the pipes and a current of air was drawn through the inner pipes. These condensers were usually made of wrought iron, on account of the comparataively thin walls of the pipes there was a greater radiation of heat. In warm weather it often became necessary to have a spray of water in the inner tubes to assist in the cooling of the gas.

These types of condensers were easily clogged by stoppages of thick tar and pitch, and it was difficult to clean them. All condensers depending on air radiation to reduce the temperature of the gas, are subject to climatic changes hourly, daily, and seasonably, without means of regulation. The condenser now generally used as a primary condenser in coal gas works, is an upright steel shell, cylindrical in form, and containing a large number of boiler tubes, expanded into tube sheets placed near the top and bottom of the outer shell. The gas inlet is at the side above the upper tube sheet, and the outlet is at the side below the lower tube sheet. In this form of condenser the gas flows through the tubes, and the space around the tubes is filled with water. To avoid sudden cooling of the gas, the water inlet is at the bottom where the gas is at its lowest temperature, and the water outlet is at the top, so that the heated water comes in contact with the tubes where the gas is hottest. With a condenser of this type of ample capacity, the temperature of the gas may be gradually reduced, and any variations in volume of gas, or changes in atmospheric heat, may be compensated for by regulating the flow of water around the tubes.

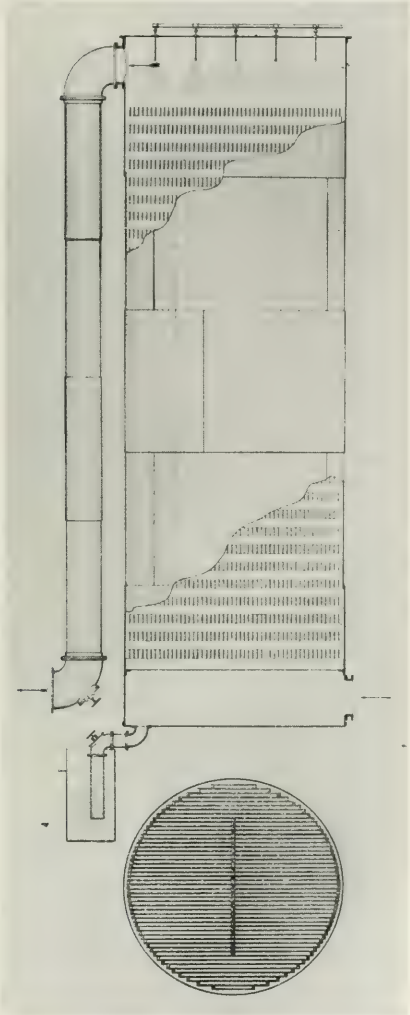
Condensation removes the tar fog, tar vapor, and ammoniacal liquor held in suspension; and these flow together from the base of the condenser, through a sealed drip-pot to the tar separator, where owing to the difference between the specific gravity of tar and ammoniacal liquor there is a separation and each flows to its own storage well.

In modern coal gas works, what is known as a foul main receives the gas from the hydraulic main and conveys it to the exhauster. This is usually a large sheet steel pipe suspended to the walls of the retort house, and acts as a condenser and at the same time some of the naphthalene in the gas is absorbed by passing over the condensed tar. In some works a simple tar scrubber either takes the place of the foul main, or is supplementary to it. The tar scrubber removes a portion of the naphthalene, and the tar gives up some of its benzol to the gas adding somewhat to its candle power. After the condensers, it is customary to pass the gas through a tower scrubber for the purpose of removing any tar remaining in it, and for the extraction of ammonia by water scrubbing.

The first tower scrubbers were filled with gas coke in deep layers resting on wooden trays. This material was taken from stock always at hand, and proved efficacious as a filtering material. It had the troublesome disadvantage of becoming clogged with tar and causing back pressure. This required frequent changing and it often happened at inopportune times. The coke after being used in the scrubber was again used as a boiler fuel. Probably the best form of scrubber is an upright steel shell filled with wooden trays, or grids, made by spacing boards on edge in sections which completely fill the shell; each section being placed at right angles to the one immediately above and below it. Water is sprayed over these trays at the top, and flows downward through the trays and overflows at the bottom into a sealed drip-pot. The gas inlet is at the bottom below the trays, and the gas outlet is at the top above the trays. In this manner a large area of wet surface is presented to the gas with a minimum use of water. The ammonia in the gas, which is not condensed as gas liquor in the hydraulic main and condensers, is removed by water in the scrubber and washers, and the temperature of the gas is still further reduced. To completely remove ammonia by absorption by water, it is necessary to reduce the temperature of the gas to 60° Fah.

The scrubber water flows to the ammoniacal liquor well, and as this liquor is a valuable by-product great care is used in saving it, and it is then pumped back to the scrubber and is used over and over until it has reached a marketable strength.

The final treatment of the gas for the removal of ammonia is by passing the gas



Modern Scrubber for Coal, Water or Oil Gas.

through a rotary washer, consisting of a number of circular discs fastened to a revolving shaft in a cast iron case. These discs are made of thin sheets of iron spaced about 1/8 inch apart; and each disc revolves in a separate compartment. Gas enters the washer at one end, and after passing between the sheets of iron in the discs, passes out at the other end. These discs are sometimes made of wood. The compartments are so arranged that there is a different water level in each one, this is accomplished by having a slightly lower overflow opening in each succeeding compartment. Fresh water is admitted to the upper or gas outlet end of the washer, and flows slowly through to the lowest overflow, filling all the compartments. These discs revolving in the water are constantly presenting freshly wetted surfaces to the passage of the gas.

The amount of water used in washing gas ranges from 10 to 15 gallons per ton of coal carbonized. The ammoniacal liquor in the washer also removes a considerable amount of sulphuretted hydrogen and carbon dioxide from the gas. The effects of condensing and scrubbing on crude gas are about as follows:

*Gas	H_2S grams per 100 cu. ft.	Ammonia grams per 100 cu. ft.	CO_2 per cent by volume
Outlet Exhauster	610	223.1	2.57
Outlet Condensers	590	196.4	2.34
Outlet Scrubbers	470	93.1	1.98
Outlet Rotary Washer.	400	.37	1.58

Only about 1/5 of the nitrogen of the coal is recovered as ammonia, and most of this during the latter part of the distillation period.

Ammoniacal liquor is usually sold by the gas companies to outside manufacturers, although some companies and many of the coke oven plants convert the liquor into ammonium sulphate and other products. The strength of the liquor is expressed in ounces, and refers to the number of ounces of real sulphuric acid required to neutralize each gallon of ammoniacal liquor. The Twaddell hydrometer was formerly used to determine the strength of liquor; each degree Twaddell corresponding to two ounces of strength, but this method is not reliable, and is much to the advantage of the purchaser. A better way is to use a standard acid solution, specific gravity 1,068,

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*Mr. W. H. Fulweiler.

and for each 16 liquid ounces of the ammoniacal liquor the number of ounces of the standard acid solution used to neutralize it indicates the number of ounces of real sulphuric acid (H_2SO_4) required for each gallon of ammoniacal liquor. Litmus paper is used to indicate neutrality. The amount of ammoniacal liquor produced in the coal gas works varies with the quality of the coal, and the temperature to which it is subjected in distillation, and ranges from 13 gallons to 45 gallons of 8 ounce liquor per ton of coal carbonized. The usual amount is about 25 gallons.

*A fair yield of ammonium sulphate per ton of coal is 20 pounds. The importance of this industry is shown by the world's production of sulphate of ammonia for the year 1912:

Germany produced	465,000	tons
United Kingdom produced	379,000	"
United States produced	165,000	"
France produced	68,500	"
Belgium produced	49,500	"
Austria Hungary and the rest of Europe	170,000	"
	1,297,000	"

The next step in the treatment of the gas is purification for the removal of sulphuretted hydrogen, organic sulphur compounds, and carbon dioxide.

The first efforts in this direction were made by Clegg when he mixed quicklime with the water in the gas holder tank at Halifax. This did not insure sufficient contact between the hydrate of lime and the gas to accomplish the expected result, but in 1815 Accum, in a treatise on gas-light, described a lime machine which utilized a cream of lime as a purifying agent. This is the most efficient and economical form in which lime can be used for gas purification.

This method was used until the '50s, and its use was reluctantly abandoned on account of the difficulty of disposing of the spent lime known as "blue billy."

In conjunction with the milk of lime purifiers, a copperas washer was used. The general design of this piece of apparatus was the same as the wet lime purifier, but a solution of copperas in water was used instead of the milk of lime. The copperas washer was soon abandoned, but attention is called to it now because of recent demands for cyanides for the recovery of gold from low grade ores. The source of these cyanides is the cyanogen extracted from coal gas, and the process employed by Dr. Bueb consists in scrubbing the gas before its ammonia and sulphuretted hydrogen have been removed, with a solution of copperas in water. It has been found that the "Standard" scrubber is well adapted to treat the gas with copperas solution. The use of dry lime for purifying was invented by Reuben Phillips of Exeter in 1817, and on account of the convenience of handling and the easy disposal of the refuse, the gas engineer adopted a method which reduced the purifying value of lime from 14,000 cubic feet to 5,000 cubic feet per bushel of lime, thus over 64 per cent of the value of the purifying material was sacrificed to convenience, and to avoid nuisance.

In the days of Phillips, dry lime purification meant the passage of gas through a series of thin layers of lime powder in the purifier, which at its best would not extract the impurities from over 5,000 feet of gas per bushel.

This method was used until 1875, when Mr. Theobald Forstall of New Orleans taught the gas engineer to nearly double the efficiency of lime, and reduce the back pressure in the purifier by a simple method of treating the lime. More water was used in slaking the lime, and the slaked lime was passed through a wire screen which reduced it to granular pellets the size of a hickory nut.

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*Coal Tar and Ammonia, by Geo. Lunge.

The proper degree of moisture was found to be that beyond which any excess would cause the "dough" to adhere to the screen instead of breaking through. The dry lime weighed 60 pounds to the bushel, while lime prepared by this method weighs 92 pounds per bushel. Lime purification removes the carbon dioxide, sulphuretted hydrogen, and organic sulphur compounds, and the spent lime in the boxes first in series removes the carbon disulphide. This is ideal gas purification, but the expense for lime and labor, and the provision of dumping ground for the waste material brought about a search for a less expensive method.

Oxide of iron purification was patented in 1840, and in 1849 a French patent was granted, which included mixing sawdust with the iron, and specifies that it may be revived by contact with the air and used again.

It was a hard struggle for conservative gas men to adopt a new method of purification which did not remove all the impurities although it promised a large saving in cost, but it began to be understood that a small amount of carbon dioxide was not very harmful in the gas, and that as long as no sulphuretted hydrogen was permitted to remain in the gas a reasonable amount of sulphur compounds did no harm, and so oxide purification was adopted.

The material known as iron oxide is hydrated ferric oxide. This occurs naturally as bog ore or may be manufactured by rusting iron borings, or using copperas as a source of iron.

In the making of oxide of iron for gas purification, the proper amount of copperas for a batch to be mixed is placed in barrels and a very small amount of water added, the water of crystallization of the copperas being almost sufficient to liquify when the copperas is heated slightly by steam, steam being blown directly into the barrels. Sawdust sufficient for a batch of oxide is levelled off on the floor to a depth of about 8 or 10 inches. The copperas in the amount of 20 lbs. to the cubic foot of sawdust is then poured over it and turned over until thoroughly mixed. Lime in the amount of 10 lbs. to the cubic foot of sawdust is then slaked to a consistency which will hold the form of a hand when a portion of the lime is squeezed. Half of the lime is then mixed with the copperas and sawdust, and the mass turned over and packed with the flat side of a shovel until no lime is perceptible. This is allowed to oxidize for 24 hours, when the second half of the lime is added in the same manner and is again turned over and allowed to oxidize. Before stacking as finished oxide, the mass should be turned at least five or six times to allow thorough oxidization, and to prevent overheating.

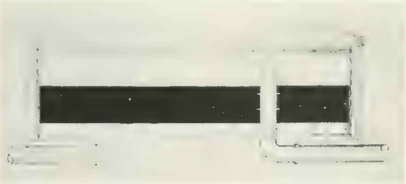
FORMULA

Bushel	Pounds	Pounds
1 Sawdust	12½ Slaked Lime	25 Copperas

OR

Cubic Ft.	Pounds	Pounds
1 Sawdust	10 Slaked Lime	20 Copperas

Iron borings rusted by a solution of sal ammoniac in water is sometimes added to advantage. Until recently the accepted shape of purifier was a square pan-shaped vessel made of cast iron plates, and provided with a sheet steel cover fitted to a water seal, or lute joint, around the top of the purifying box. This joint is gas tight and saves much time over any method of fastening a cover by bolts. The area of the boxes is according to the capacity of the gas works, while



Sectional Elevation of Jones Gas Purifier.

the depth was at first from 3 to 4 feet and is now increased to greater depths. The new purifiers at the Astoria Plant of the New York Consolidated Company are 40 feet square and are 8 feet in depth, containing 2 layers of oxide 42 in. thick each. Purifiers are usually arranged in groups of four, either in the form of a square or in a straight line, and as it is necessary to change the sequence of boxes for the purpose of renewing or reviving the purifying material, the course of the gas is regulated by a center-seal, (a dry seat revolving valve which connects three boxes in regular sequence and completely shuts off the gas from the fourth) or preferably by a system of valves so arranged that the sequence of the boxes may be changed at will and all four boxes used at one time. This method increases the purifying capacity of the works by permitting the use of the fourth box.

When lime was used to purify gas six thin layers (from two to four inches thick) were used. These were finally reduced to two thicker layers. Oxide of iron was first used in two thin layers, and as it became evident that the back pressure was not seriously increased by using thicker layers of purifying material, the depth was increased until modern purifiers are filled with oxide in one layer, from four to six feet deep.

The reactions of oxide of iron in removing sulphuretted hydrogen from gas are:

$$Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O \text{ and}$$
$$Fe_2O_3 + 3H_2S = Fe_2S + S + 3\,H_2O$$

simultaneously and the proportion is 3 parts of the ferric sulphide and 5 parts of the ferrous sulphide.

Cyanogen when not removed combines with the iron forming Prussian blue.

The great advantage of oxide of iron purification over any other, is that after it has performed its work it may be revivified by bringing it in contact with the air, and it may be used and revived until the sulphur content reaches above 50% of the weight of the purifying material.

Following is a typical analysis of spent oxide:

*Ferric oxide	26.71%
Metallic iron	.06%
Free sulphur	54.56%
Prussian blue	2.56%
Tar	4.11%
Wood shavings	12.00%
	100.00%

It was at first the practice to remove the oxide of iron from the purifier each time after it had done its work and spread it on a floor, turning it until each particle had been revivified by contact with the air. An improvement on this method consisted in raising the cover of the purifier and drawing air downward through the purifying material by means of a steam jet exhauster, or a rotary fan exhauster. This method saves time and labor and prevents the breaking up of the oxide by handling.

The period of revivification is from two to four hours, at the end of which time the material is ready to be used again.

Air should be drawn through the purifying material and not blown through it, as blasting causes local revivification with the generation of heat so intense as to set fire to the oxide.

It is customary in many modern gas works, and it is recommended by eminent authorities, to revive the oxide of iron in place by admitting a small quantity of air at the inlet of the purifiers. The air provides the necessary oxygen to continuously revivify the purifying material without taking the purifier out of use. The amount of air necessary is from 2 to 2½% of the volume of the gas. One authority states that from 0.5 to 0.7 per cent of oxygen is theoretically needed for the continuous revivification of oxide. The discovery of a method of producing cheap oxygen

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*Mr. W. H. Fulweiler.

would at once make this an ideal method of revivifying oxide.

The latest type of purifier adopted by the larger gas works in California, is a series of round wooden boxes made of redwood staves. These boxes are 30 feet in diameter and 9 feet deep. The top of the boxes is covered with water to a depth of about two inches, and grooves between the staves connected by holes passing through the staves provides a system of water soaked gas tight boxes. The heads of the boxes are of redwood, and doors are provided on the top head and at points on the side for filling and emptying, and for the admission of air while revivifying. The oxide of iron is placed on wooden grids, in one layer of any desired thickness. It is customary to use a layer from 5 to 6 feet deep. These boxes have a daily purifying capacity of one million cubic feet of gas each.

After leaving the purifier, the gas passes to a station meter where it is measured and is then stored in the gas holder ready for distribution.

"International Gas Congress, San Francisco 1915"

To the Members of the
Pacific Coast Gas Association:

It is with extreme regret that I have to announce the death of our President, Mr. Henry E. Adams, of Stockton, Cal., on March 12th, 1913, due to a stroke of apoplexy. In consequence of this Mr. C. S. Vance, Vice-President, of Los Angeles, Cal., will take up the reins of the Association.

The authors of the papers to be presented at our 21st Annual Convention, which will be held at San Jose, Cal., in September, are already at work, and all will be of great interest to the fraternity at large.

It might be opportune at this time to state that the Degree of Gas Engineering has been finally incorporated in the curriculum of the University, and our Mr. John A. Britton and Mr. E. C. Jones are at present engaged in giving a series of lectures before the students in connection with the same.

At this time there are no new developments to report in connection with the International Gas Congress to be held in 1915, except to say that the same is receiving attention at the hands of the Committee of the American Gas Institute, and its success even at this early day is already assured.

Our Experience Editor, John Clements, of Pacific Gas and Electric Company, Oakland, Cal., and our Wrinkle Editor, H. M. Burkhart, of the Southern California Edison Co., Los Angeles, Cal., will be glad to receive contributions from all members in so far as their respective departments are concerned.

Our Novelty Editor, Mr. H. P. Pitts, of the Pacific Gas and Electric Company, San Francisco, will of course be glad to receive any suggestions from members concerning the work of his department.

It will be the earnest endeavor of your officers to have our twenty-first convention eclipse our previous conventions; however, in order to do this they must have the hearty cooperation of members.

We should also make every endeavor at this time to increase our membership, and all members should make it a point to call the attention of their associates or other of their acquaintances who are eligible for membership to the good work that our Association has done in the past and is now accomplishing in so far as the Degree of Gas Engineering at the University of California is concerned, and the further advantages that can be obtained by them by being in attendance upon our meetings.

Application blanks and copy of our constitution and by-laws will be furnished upon request.

Yours very truly,

Henry Bostwick, Secretary.

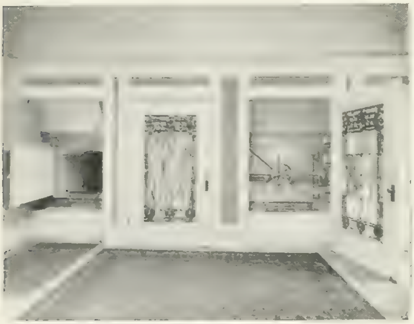
"Pacific Service" at Mount Olivet

By JOHN B. REDD, Industrial Fuel Engineer

J B Redd

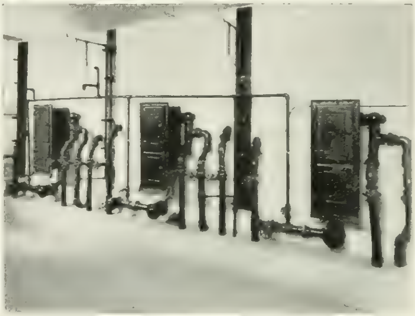
THE part played by "Pacific Service" at the Mount Olivet Cemetery near San Francisco, is not a minor role by any means. The electric energy for operating a 50-horse-power motor driven pump which distributes water to the splendidly kept lawns and flower gardens has been supplied by the Pacific Gas and Electric Company for several years, while just recently we were again called upon to make additional electric connections and to extend our gas mains for the purpose of supplying fuel for operating the new incinerator, which, at the present writing, has been in successful operation since December 1st, 1912.

The accompanying pictures will give an idea of the magnitude of the plant, but to realize fully the operation of the incinerator, I would advise a visit to Mount Olivet, where you will meet the Superintendent, Mr. M. Jensen, a most congenial and pleasing gentleman, willing at all times to show visitors the workings of the plant. Many people who have shuddered at the thought of cremation, have witnessed a case at this plant, and have gone on their way thoroughly convinced that cremation is the best and by far the most hygenic method of disposing of our honored and respected dead.



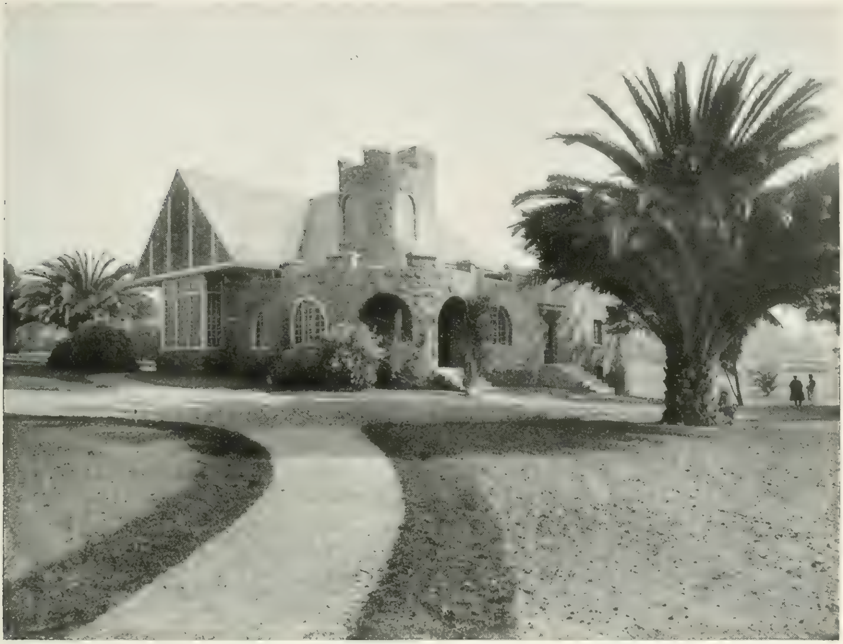
Retort Chamber—Front View.

Incineration has gained in popularity rapidly since 1883, when the total number of cremations in the entire United States was only 25, while the latest official statistics show 6,665 for the year 1909. Unofficial reports since 1909 show even a greater percentage of increase per year.



Retort Chamber—Back View.

Gas has many advantages over all other fuels used for this purpose, particularly as the products of combustion and smoke can be controlled and forced into a low combustion chamber, where all unburned gases and smoke are consumed by the use of a secondary blast burner which is directed against checker-brickwork built in the throat of the chimney. All of the gas burners are of the blast type, the air being supplied at 2 pounds pressure from a positive pressure blower (capacity 600 cubic feet per minute) direct connected to a 3,400 RPM 10 horse-power motor. The gas is supplied from a high pressure main and reduced from 40 pounds to 9 inches of water pressure by the use of two large regulators.



Chapel at Mount Olivet, with Crematorium in the Rear.

A 200-light meter registers the gas used and is connected to a 4-inch pipe or main which entirely surrounds the 3 retorts. The air main is 6 inches in diameter and also surrounds the retorts, making a complete circulating system for both gas and air. Two inch pipe connects from the main to each set of burners as shown in picture No. 2. Picture No. 1 is a front view of the incinerator showing one retort with both doors open, one with the fire door closed and both doors closed on the center retort. The last picture is of the new $30,000 building, in which there is a magnificent chapel and three retorts. The background of this picture shows a portion of the grounds and the condition in which they are kept twelve months of each year.

Pacific Service Magazine

PUBLISHED IN THE INTERESTS OF ALL THE EMPLOYEES OF THE PACIFIC GAS AND ELECTRIC COMPANY

JOHN A. BRITTON	EDITOR-IN-CHIEF
FREDERICK S. MYRTLE	MANAGING EDITOR
A. F. HOCKENBEAMER	BUSINESS MANAGER

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The Pacific Gas and Electric Company desires to serve its patrons in the best possible manner. Any consumer not satisfied with his service will confer a favor upon the management by taking the matter up with the district office.

VOL. IV APRIL, 1913 No. 11

EDITORIAL

The annual meeting of the Pacific Gas and Electric Company's stockholders, held on the 8th day of the current month, brought out remarkable evidence of the general confidence reposed in the administration by the 2,800 stockholders who are scattered all over this country and abroad.

The day before the meeting took place Secretary Foote announced that he had received proxies from no less than 2,200 stockholders, representing, in round numbers 320,000 out of the total issue of 420,000 shares. Ninety per cent of the stockholders were represented at the proceedings, which were purely formal. The existing boards of officers and directors were re-elected as a matter of course, and the reports of General Manager Britton and Treasurer Hockenbeamer were adopted with every evidence of satisfaction and approval.

The Treasurer's report was made public several days in advance of the annual meeting. It contained the following statement concerning present conditions and prospects for the future:

"The Company made a net gain of 33,764 consumers of gas, electricity and water, or almost 12 per cent. Except for reductions in rates made to consumers, the larger volume of business in 1912 would have increased the Company's revenues by more than a million dollars. These reductions benefitted approximately ninety per cent of all the company's consumers, and, in the opinion of those familiar with the value of the company's properties, have established a firm basis for its future growth.

"The company expended during 1912, $7,840,830 for additions, improvements and betterments. It is estimated that fully $5,000,000 of this investment produced little or no income at all during 1912, but should materially add to the company's earnings in 1913, and to a still greater degree in 1914, when the company will begin deriving benefits from its new hydro-electric developments on Bear River, which will have an ultimate capacity of about 160,000 horsepower.

"People in close touch with the activities and policies of the company express the opinion that the year 1912, with its general readjustment of rates and large burden of new construction, afforded as severe a test of the stability of the company as it is likely ever to have to undergo, and that during 1913 and in still greater degree thereafter the company should show remarkably good results."

Among other interesting information contained in Mr. Hockenbeamer's report was the fact that in the seven years since the organization of the Pacific Gas and Electric Company it has expended $31,415,232 for plant additions. During the same period the total par value of its outstanding bonds has increased $23,200,000, indicating the creation of an equity for the bond holders of the Company in excess of $8,000,000. During the year 1912, $1,014,000 of bonds were retired through the operation of sinking funds, making the total so retired to December 31st, 1912, $6,167,000.

Since 1907 the Company's annual taxes have increased from $247,000 to $622,000, an increase of 190% within six years.

Mr. Britton's report contained a careful compilation of data and statistics which afforded the stockholders concise information concerning the company's physical resources, growth of business and expansion of operations. Under the head of statistics the report shows 9 hydro electric power plants in operation at the present time, with a total installation of 90,227 horse power. To these are added the steam-electric plants in operation in the four big cities of the company's territory, San Francisco, Oakland, San Jose and Sacramento, with a total capacity of 94,100 horse power. The number of consumers of electricity is given as 116,666, to accommodate whom the company has in operation 2,321 miles of overhead distribution lines, 67 miles of underground conduit, 6,052 street arc lamps and 12,122 incandescent.

The statistics from the Gas Department show the number of gas plants in operation by the company at the present time as 17, including plants in the principal cities of the vast territory covered by the company's system. The number of gas consumers in 1912 was 196,133 and the total amount of gas sold 6,691,072,400 cubic feet. For the accommodation of these consumers the company operates 48 gas generators with a total daily capacity of 42,000,000 cubic feet, 2,201 gas mains, 17,242 gas arcs and 8,436 gas street lamps.

From the Water Department the figures show 8,071 water consumers during the past year. The company's system includes a reservoir capacity of 2,472,509,500 cubic feet.

The following additions to the physical plant of the company were made in 1912: Hydro electric substations, 15; Steam plants, 1; Steam mains, 2.6 miles; High tension transmission lines, 141 miles; Low tension distributing lines, 411 miles; Gas mains, 283 miles; Water mains, 7 miles; Gas, electric and water service, 33,435 miles.

No less than 10,100 appliances were installed in the Gas Department during the year. The sum of $1,106,330 was spent during the year for maintenance alone.

There was expended in new construction, inclusive of the Lake Spaulding-Bear River development, $7,821,712.00.

Manager Britton's report calls attention to the Panama Pacific Exposition contracts for light, heat and power which were secured recently by the Pacific Gas and Electric Company and the installation for which, according to the report will call for a maximum demand of 20,000 horse power.

With such a showing as this the annual meeting was little more than formal in character, all the stockholders present expressing themselves as perfectly satisfied with both present conditions and prospects for the future.

In the present issue of Pacific Service Magazine will be found the second lecture of the series now being delivered at the University of California by our Mr. E. C. Jones to the students of gas-engineering. The subject is "Purification of Gas."

Last month we called attention to this new course of study recently inaugurated at the State University through the active interest of Mr. John A. Britton, who is a member of the Board of Regents. Mr. Britton not only opened the course with a comprehensive lecture delivered by himself upon the history and development of the gas industry but within the past month he appeared a second time before the students with an instructive discourse upon the systematization of accounts.

The Pacific Coast Gas Association, to which Mr. Britton, Mr. Jones and a large number of members of "Pacific Service" belong, has appropriated a fund to defray the cost of the newly established course in gas-engineering. Needless to say, however, the lectures being given by both Mr. Britton and Mr. Jones are labors of love, so to speak, the sole compensation therefor being the gratification both these gentlemen enjoy in the thought that they are active workers in a good cause.

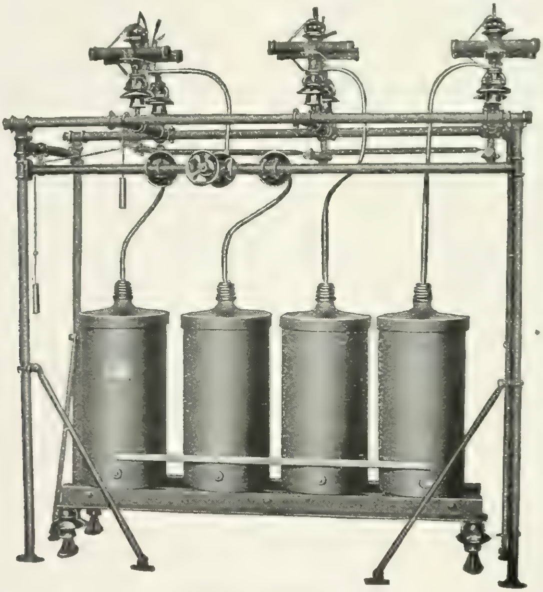
The Use of Lightning Arrestors in San Francisco

By J. W. VARNEY, Supt. of San Francisco Substations.

J. W. Varney

It is a well known fact that the disaster of 1906 did a very great deal of damage to the underground distribution system of the Pacific Gas and Electric Company in San Francisco, but the subsequent results to the operating department are not so well known.

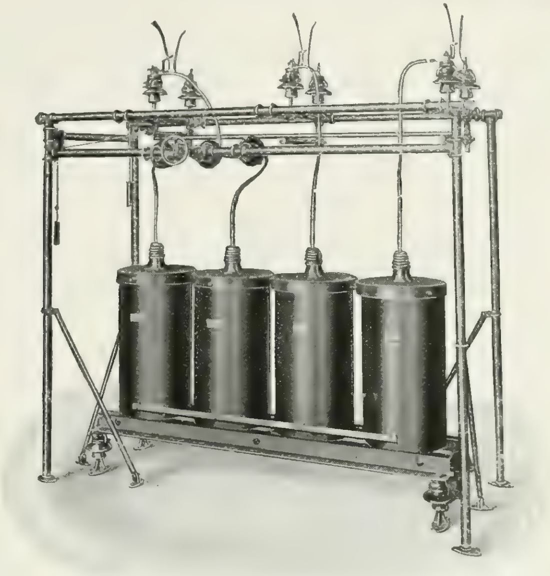
In many places duct lines were broken and cables pulled out of shape and mechanically strained very badly. Besides these strains, which were sufficient at times to rupture the lead armor, the duct lines, being cracked, allowed water to enter and follow the ducts until faults in the lead were reached and, in the course of time, moisture caused burnouts with consequent station troubles.



Cable type arrestor

It was a notorious fact that these arcing grounds set up surges on the 11,000 volt system which almost invariably caused trouble at weak points of the system to such an extent that reports of trouble usually came first from stations remote from the original station affected. This may, at first, sound rather paradoxical but is easily explained by the fact that the operator at the station most affected was too busy getting started again to telephone, and instructions had been given for each station operator noting trouble to report as quickly as possible to headquarters; and thus by getting the different angles on the trouble the fault was more easily located.

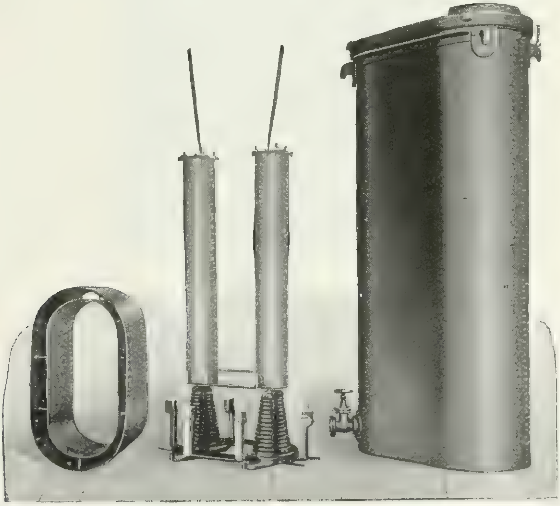
At Station "C" there were operating two 11,000 volt, 1,000 K. W. induction motors



Overhead type arrestor

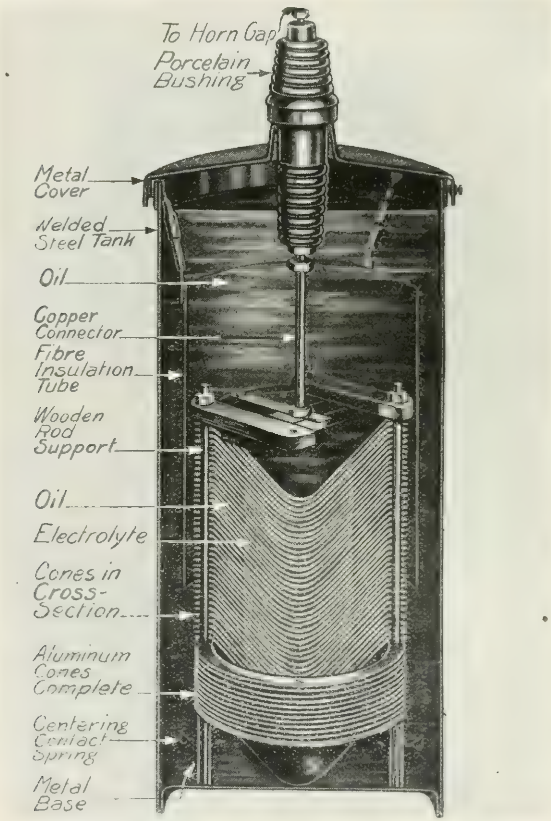
with very small air gaps, and a heavy surge on the system was very apt to puncture the armature insulation of these, if running.

These conditions plainly indicated the need of some apparatus which would relieve the system of surges, and considerable thought



Largest lightning arrestor ever built

was given to such an appliance. The old multigap lightning arrestor was considered, but reports concerning it were very discouraging and the electrolytic aluminum cell arrestor was new to the system. After considerable discussion one of the latter type was installed on the 11,000 volt busbars of Station "C", on Jessie Street. It was of the indoor type, for overhead lines, with four stacks of twenty-eight cones each, for the underground neutral system in use in San Francisco. For some time after this arrestor had been put into service there were no very serious disturbances on the system, but finally it came when an interconnecting cable between Stations "C" and "D" broke down. This cable was hot from Station "C" but idle at Station "D".



Exploded view of lightning arrestor

The first indication of trouble was the arrestor at Station "C" discharging, and on testing it was found that one leg of the 11,000 volt system was grounded. No further trouble was noted, but an immediate search was started for the fault, by isolating cables, one at a time, until the defective one was eliminated. This operation was accomplished by taking over each cable successively, with its load, onto a separate engine. The operation consumed in all twenty minutes, during which time the arrestor was discharging, intermittently, at frequent intervals.

The writer feels justified in saying, from former experience, that if this arrestor had not been in service serious damage would have been done in more than one station.

Since that time there have been several disturbances which the arrestor has taken care of, and the trouble located more quickly, and many times have the arrestors discharged when no damage could be found. This might have been caused by poor synchronizing or minor line trouble but in all cases the arrestors have done their duty.

Due to the above found results, six more sets of arrestors have been installed,—two at Station "A" (the power-house), one more at Station "C", two at Station "D", and one at Station "E", and more have been ordered for the other stations.

The last installed have been of the cable type—that is with a double horn gap and carbon resistance inserted in the circuit. When the first of this cable type was installed it was not satisfactory, as the charging arc was too great; and, on investigation, it was discovered that there were only twenty-four cones per stack. This number was for 11,000 volts maximum, and as our voltage sometimes went as high as 12,500, when paralleled with the transmission, it was found necessary to add the extra four cones and replace most of the old ones on which the film had been punctured by the excessive voltage.

Recently, after the first arrestor had been in service for about eighteen months, it was discovered that when the overhead type arrestor was being charged there was considerable static current induced on the lead sheathing of any ungrounded cable in the vicinity, and on inquiry it was learned that similar experience had been had at other places, so the necessary carbon resistances and horn gaps were immediately ordered.

While attending the convention of the National Electric Light Association in Seattle last year, the writer had the pleasure of seeing the open air arrestors of this type discharge during a storm at the Snoqualmie Falls plant, with perfect results, and on inquiry found the opinion universal in that district that they were indispensible.

Welcome the New-born N. E. L. A. Bulletin!

Readers of Pacific Service Magazine who are interested in our Company Section of the N. E. L. A. will observe that this issue fails to contain the reports of last month's proceedings, question box, editorial and other matter that has appeared herein ever since the company section was inaugurated.

The explanation of this apparent ommission is that Pacific Service Magazine is no longer the official organ of our company section. Membership in the section has grown to a point where it is deemed imperative to follow the example of other company sections and get out a monthly Bulletin. This is being done, and the new publication starts with the April number which is now in the hands of the printer.

"We are naturally a little late getting out our first number, but we hope to do better next month and ever after that," states Secretary Harry Bostwick. "Our work will be more and more voluminous in detail as our membership increases—we were 89 last October and now we number 466—and we realize that there is no room in Pacific Service Magazine for all we wish to record regarding ourselves and our doings. So we are striking out on an independent tack and we think we have enough ginger in us to make it a go."

Noting Progress of the World's Fair

That matters financial in connection with the Panama-Pacific Exposition are in a remarkably healthy condition appears from a financial statement submitted to the stockholders by Comptroller Rodney S. Durkee.

The statement embraces receipts and expenditures from the beginning of operations up to and including February 28th. It shows that there has been received in subscriptions to stock $2,833,725.30; from the sale of State bonds, $288,674.75, and from municipal bonds $553,599.00. In addition to these amounts there has been received a sum of $49,342.82 from concessionaires, making the total receipts $3,762,954.78.

The following table of disbursements is given:

Preliminary expenses to Sept. 30, 1911	$377,515.01
Real Estate purchased	304,974.62
Cost securing sites, leases, rentals	675,811.75
Buildings and grounds	825,464.84
Administration	100,863.59
Exploitation	185,271.13
Exhibits	58,199.09
Concessions and admissions	10,521.63
Reception	13,420.46
Traffic and terminals	813.38
Protection	477.15
Furniture and equipment	24,979.08
Unclassified and unassigned	6,061.03

The expenditures total $2,584,372.76, so that there is an unexpended balance of $1,178,582.02. The statement also shows that there are signed subscriptions aggregating $6,107,330. Including this quarterly call, subscribers have been requested to pay 60 per cent of their subscriptions, or $3,664,398.

"In sending out this financial statement," said Comptroller Durkee, "we do so for the purpose of keeping our stockholders informed.

"It is reasonably safe to predict that on the 1st of July our delinquent subscriptions will be but a very small percentage of the total.

"In view of the fact that former expositions have never collected more than 92 or 93 per cent of their subscriptions, it is obvious that the enthusiasm manifested at the time subscriptions were made will extend over the collection period and result in a much larger percentage of collections than has ever been recorded before."

The Kingdom of Denmark has been added to the list of foreign nations that have selected sites for their exhibits on the exposition grounds. The dedication ceremonies took place March 15th, the Danish Minister personally unfurling the flag of his country amid the cheers of a large concourse of spectators.

The Executive Committee has approved the plans of the million dollar auditorium which is to be erected in San Francisco Civic Center. It will be a stone building, the finest of its kind in the United States, and its seating capacity will be approximately eleven thousand. The sum of a million dollars has been set aside for its construction.

Dr. George W. Stewart of Boston has been appointed Musical Director of the Exposition. He occupied a similar position at the St. Louis World's Fair in 1904.

Construction work is proceeding at a record-breaking pace, thousands of men being employed on the Harbor View site. Every one of the fourteen exhibit buildings to be erected will be well under way during the coming July and will be completed with a year from that date.

In preparation for the great volume of travel expected to come to San Francisco through the opening of the Panama Canal, the Southern Pacific Company is preparing to double it facilities at Third and Townsend Streets. The company proposes to build a new passenger and freight station a little to the westward of where the present one stands, with fourteen tracks leading to it. The proposed changes are estimated to cost $1,700,000.

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District	Headquarters	Manager	District	Headquarters	Manager
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			Petaluma	Petaluma	H. Weber
			Placer	East Auburn	H. M. Cooper
Antioch	Antioch	F. J. Southerland	Redwood	Redwood City	E. W. Florence
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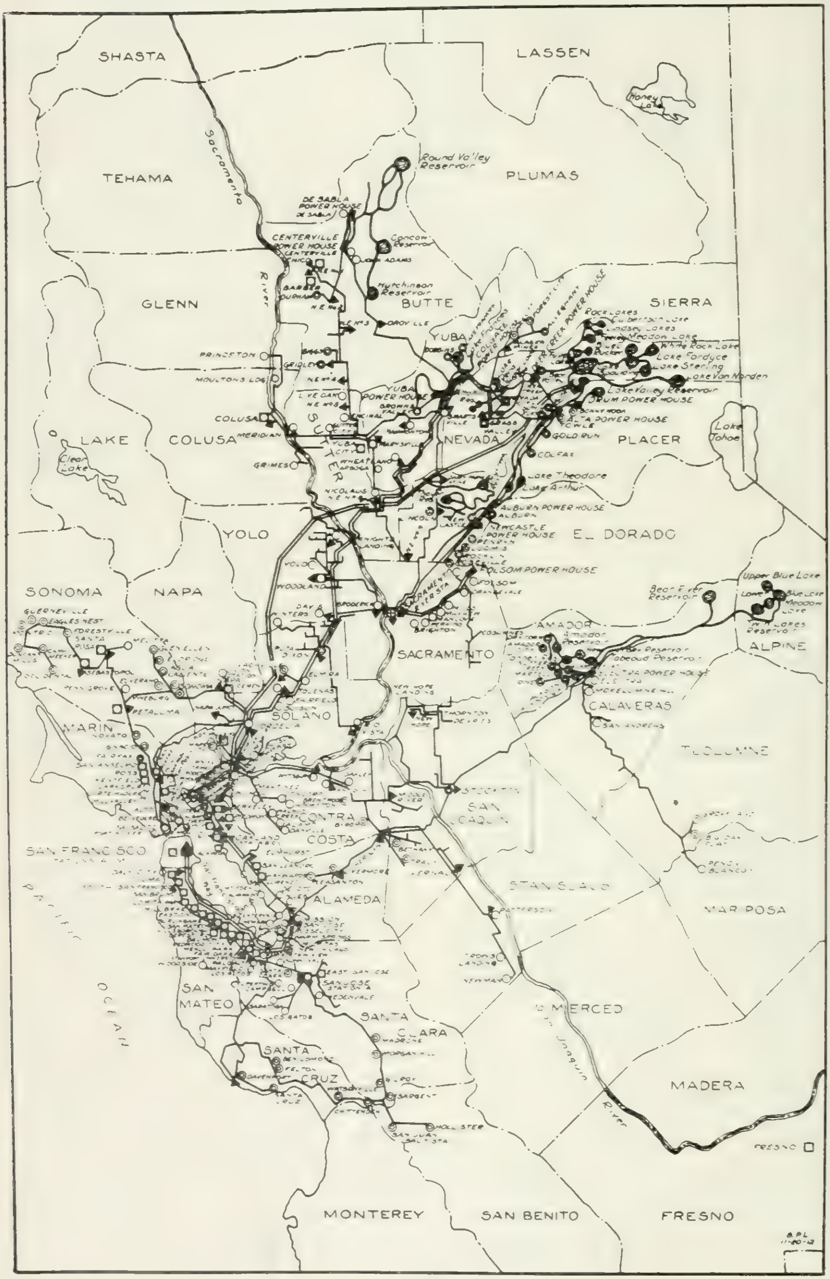
SHASTA
LASSEN
Honey Lake
Sacramento River
TEHAMA
Round Valley Reservoir
PLUMAS
DE SABLA POWER HOUSE
CENTERVILLE POWER HOUSE
CHICO
Concow Reservoir
Hutchinson Reservoir
GLENN
BUTTE
OROVILLE
SIERRA
Rock Lakes
Culbertson Lake
Lindsey Lakes
Meadow Lake
White Rock Lake
Lake Fordyce
Lake Sterling
Lake Van Norden
Lake Valley Reservoir
DRUM POWER HOUSE
ALTA POWER HOUSE
YUBA
YUBA POWER HOUSE
PRINCETON
GRIDLEY
MOULTONS LDG
COLUSA
MERIDIAN
SUTTER
YUBA CITY
GRIMES
LAKE
Clear Lake
COLUSA
NEVADA
GOLD RUN
COLFAX
PLACER
Lake Tahoe
Lake Theodore
Lake Arthur
AUBURN POWER HOUSE
AUBURN
NEWCASTLE POWER HOUSE
EL DORADO
YOLO
WOODLAND
FOLSOM POWER HOUSE
SONOMA
NAPA
Upper Blue Lake
Lower Blue Lake
Meadow Lake
Twin Lakes Reservoir
Bear River Reservoir
AMADOR
ALPINE
SACRAMENTO
SANTA ROSA
PETALUMA
SOLANO
CALAVERAS
SAN ANDREAS
MARIN
TUOLUMNE
STOCKTON
SAN JOAQUIN
CONTRA COSTA
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
PACIFIC OCEAN
SAN MATEO
SAN JOSE
SANTA CLARA
MERCED
San Joaquin River
SANTA CRUZ
MADERA
HOLLISTER
SAN JUAN BAUTISTA
FRESNO
MONTEREY
SAN BENITO
FRESNO

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

	Place	Population
	Alta	20
1	Alameda	25,000
	Alamo	50
3	Albany	800
5	Amador City	200
	Adams John	25
	Alleghany	200
	Alto	25
	Angel Island	280
5	Auburn	2,375
	Agua Caliente	100
	Alvarado	900
	Antioch	3,000
	Arboga	100
3	Barber	500
3	Belmont	350
	Ben Lomond	800
	Belvedere	1,000
	Benicia	3,360
2	Beresford	25
3	Berkeley	40,000
	Biggs	750
	Big Oak Flat	20
	Brentwood	200
	Brighton	100
	Broderick	200
5	Brown's Valley	50
	Byron	200
3	Burlingame	4,000
	California City	25
	Camp Meeker	200
	Campbell	600
	Centerville	1,000
	Centerville	20
3	Chico	13,000
2	Colma	3,500
3	Colusa	1,500
	Concord	1,500
	Cement	1,500
5	Colfax	500
	Cordelia	150
	Corte Madera	350
	Crockett	2,500
	Crow's Landing	375
	Cupertino	50
	Daly City	250
	Danville	250
	Davis	750
	Decoto	350
	de Sabla	25
5	Dixon	1,000
5	Dobbins	50
	Davenport	1,000
5	Drytown	20
	Durham	500
5	Dutch Flat	500
	Duncan's Mills	150
3	Easton	300
3	East San Jose	1,660
	Eagle's Nest	50
	Edenvale	500
	Eldridge	500
	Elmira	150
	El Verano	400
	Electra	50
3	Emeryville	5,000
	Encinal	100
	Fairfax	500
	Fairfield	834
	Forestville	100
	Felton	300
1	Fresno	30,000
2	Fair Oaks	250
	Folsom	1,800
	Gilroy	2,000
	Glen Ellen	500
5	Gold Run	100
3	Grass Valley	4,500
	Gridley	1,800
	Grimes	250
	Groveland	125
	Guerneville	500
	Hammonton	500
3	Hayward	4,000
3	Hillsborough	1,000
	Hollister	3,000
	Hookston	75
	Ignacio	100
5	Ione	900
	Irvington	1,000
5	Jackson Gate	100
5	Jackson	2,035
5	Kennedy Flat	20
3	Kentfield	250
	Knight's Landing	350
5	Lake Francis	5
	Lathrop	300
	Live Oak	200
	Livermore	2,250
	Los Gatos	3,000
	Larkspur	600
5	Lincoln	1,400
2	Lomita Park	100
	Los Altos	500
5	Loomis	400
	Maletta	30
	Manlove	50
	Martinez	5,000
5	Martell	150
3	Marysville	7,000
	Mayfield	1,500
	Mayhew	50
2	Menlo Park	1,500
	Meridian	300
2	Millbrae	300
	Mills	50
	Milpitas	300
	Mill Valley	2,500
	Mission San Jose	500
	Mokelumne Hill	150
	Monte Rio	50
	Moulton's Landing	30
	Mountain View	2,500
	Mt. Eden	200
	Mare Island	500
2	Napa	7,000
3	Nevada City	2,700
5	New Chicago	10
	Newark	700
5	Newcastle	750
	Newman	1,000
	Niles	800
	Nicolaus	75
	Novato	250
3	Oakland	230,000
	Oakley	80
	Orange Vale	100
3	Palo Alto	6,300
	Pacheco	200
	Penryn	250
	Patterson	300
	Penn Grove	300
	Perkins	50
3	Petaluma	5,500
2	Piedmont	1,720
	Pike City	200
	Pinole	1,500
	Pittsburg	2,372
	Pleasanton	2,000
	Point San Pedro	20
	Port Costa	600
3	Redwood City	3,200
3	Richmond	10,000
	Rio Vista	884
5	Rocklin	1,000
5	Roseville	2,600
	Rodeo	500
2	Ross	500
	Russel City	250
4	Sacramento	60,000
	San Andreas	200
2	San Anselmo	1,500
2	San Bruno	1,500
2	San Carlos	100
3	San Francisco	416,912
2	San Jose	30,000
2	San Leandro	4,000
	San Lorenzo	100
2	San Mateo	6,500
3	San Quentin	2,500
2	San Rafael	6,000
	San Pablo	1,000
	Santa Clara	6,000
	Santa Cruz	16,000
	Saratoga	50
2	Santa Rosa	12,000
3	Sebastopol	1,200
	Sausalito	2,500
	Smartsville	500
2	South San Francisco	2,500
2	Stanford University	2,600
	Sonoma	1,200
	Stege	1,000
5	Stockton	30,000
	Suisun	1,200
	Sutter City	150
	Sutter Creek	1,500
	Sunnyvale	1,500
	Tiburon	400
	Tormey	20
	Towle	100
	Tracy	1,200
	Union Station	40
	Vacaville	1,200
3	Vallejo	15,000
	Vineburg	200
	Walnut Creek	350
	Warm Springs	200
	Watsonville	4,500
	Wheatland	1,400
	Winters	1,200
2	Woodland	3,200
	Woodside	200
	Yolo	400
3	Yuba City	1,200
	Total	1,137,992

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,800 people.

OPERATES 11 hydro-electric plants in the mountains.
5 steam-driven electric plants in big cities.
16 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,775 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

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After a while you will know it.

C. E. HARDY
165 Second St.
San Francisco, Cal.

VOL. 4 MAY 1913 No. 12

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Pacific Service Magazine

Vol. IV

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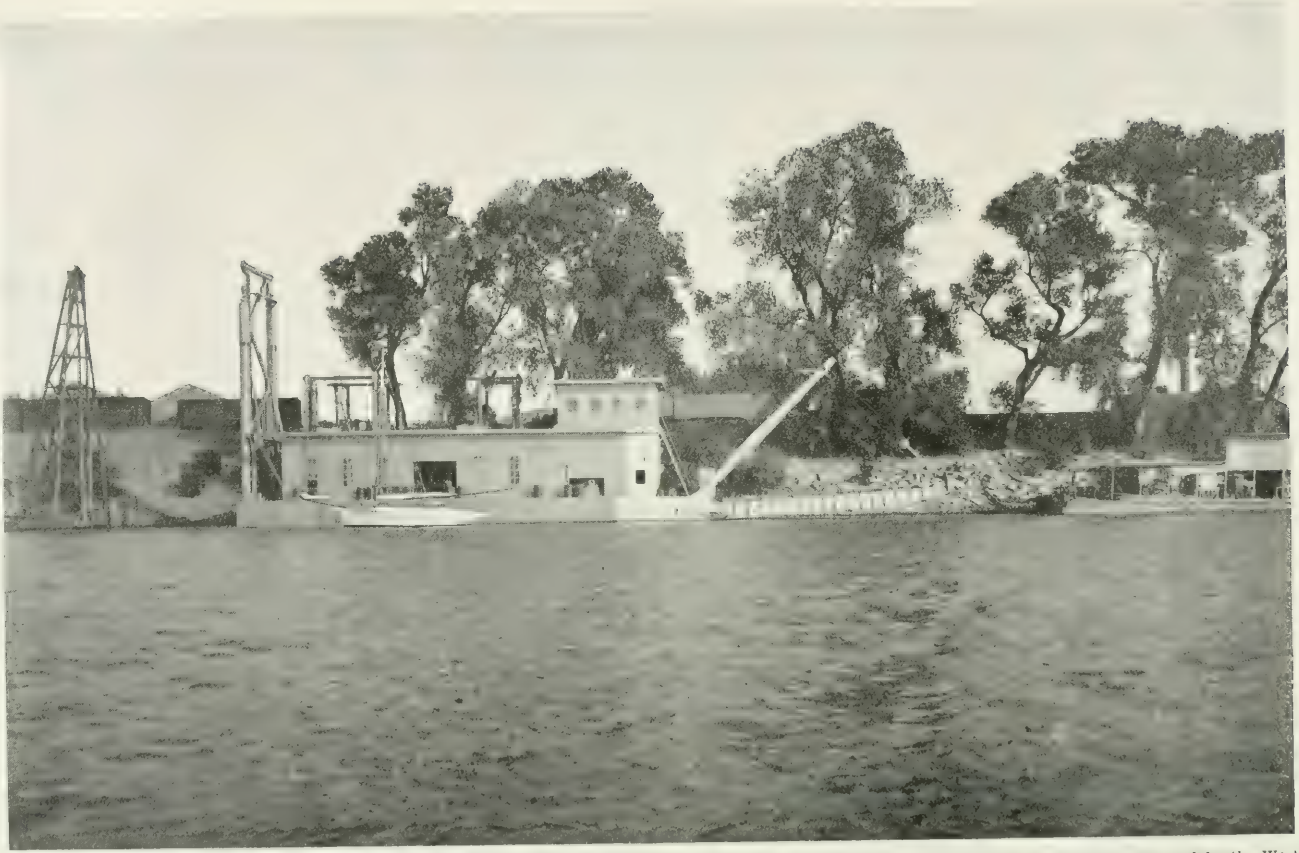


First Electrically Equipped Dredge for river work, on the Sacramento River. It was built by the Yuba Construction Company last year and is operated by the West Sacramento Company. This picture was taken in mid-stream from the Company's fast launch ''Netherlands.''

PACIFIC SERVICE MAGAZINE

VOL. IV MAY 1913 No. 12

The Passing of the Tule Lands

The Great Reclamation Work of the West Sacramento Company

Among the various forms of development in which "Pacific Service" is playing a leading part the work of reclamation in progress in the wide region watered by the Sacramento and San Joaquin rivers is attracting more attention just now, probably, than any other. The successful conversion of great submerged areas into revenue-producing tracts of orchard and farm lands has proved one of the most astonishing results of Twentieth Century enterprise on record in this country.

In the following article the work of one of the greatest of these reclamation projects, the West Sacramento Company, is outlined by the Company's general manager, Mr. Furlong. Concerning the scope of this we quote from an article published in the Sacramento Valley Monthly:

"It is not only one of the largest, but is one of the most thorough reclamation enterprises in the world. It is known as West Sacramento and is situated immediately opposite Sacramento City fronting the west bank of the Sacramento River for a distance of eight miles. Seven years ago the promoters of this project conceived the idea of building levees or dykes on a large and permanent scale, believing that the opportunity for establishing a system of protection from high water could be made as thorough and as efficient as the best in the lowlands of Holland. At this time and for many years previous thousands of square miles of magnificently productive land were going to waste because of inundation from flood waters. West Sacramento was situated in what was known as the Yolo Basin, a place that is remembered by the oldest inhabitants as an inland sea. Twelve thousand two hundred acres of this land were purchased and its owners concluded to surround it with massive and impregnable levees.

"The work of reclaiming this land and making it fit for settlement has been done in the most businesslike and scientific manner. The best of talent in every line has been obtained and the most powerful machinery employed. The work has been carried on in the most economical manner by employing only the best, regardless of first cost. The management understand that the best is always the cheapest, even though its first cost is great, and it is here that combination of capital has the advantage over individuals, for by combination work can be carried on on a wholesale scale and the pro rata of expense is very much less than any single person could perform it. So in West Sacramento, capital is preparing beautiful homes for hundreds, if not thousands, in better manner and at less cost than they could possibly do it for themselves and, at the same time, is reclaiming for the State one of the most beautiful stretches of country within our bounds.

"While the science of reclamation is probably as old as civilization itself, nowhere outside of Holland has it been steadily developed to a degree nearing perfection, but when the reclamation project of West Sacramento is completed, there will be no similar enterprise in the world more attractive, more substantial or more productive."

EDITOR PACIFIC SERVICE MAGAZINE.

Paving the Way for Settlers

By H. W. FURLONG, General Manager West Sacramento Company.

"Economy!" is the customary war cry of all financiers, when promoting any great work of development. They impress it upon their engineers, their superintendents and the managers of each construction department. But what is Economy? Some have one idea of its meaning and some another; all of them may be, in a measure, correct. Yet, it is often the case that what appears an economical method or purchase, by reason of its cheapness in price, turns out to be rank extravagance.

It is undoubtedly true that could some of the financiers in the earlier days of large development projects come back and view the methods and machinery in use today, they would accuse us of being spendthrift aristocrats. But they would be wrong, for what may seem extravagance to the layman or even to some professionals is, after all, merely a case of shrewd economy.

As an instance of this the writer ventures to put forward the nearly-completed project of the West Sacramento Company, just across the river from the capital city of California. Here, three years ago, was a great tract of low lands, embracing over 12,000 acres, which were purchased from more than 1,000 private owners and reclaimed for agricultural purposes. The writer of this article was selected by the Directors of the West Sacramento Company, Messrs. E. R. Lilienthal, Louis Sloss, Eugene DeSabla, W. P. Hammond and others of San Francisco, as their

Electric Kitchen at Headquarters Camp, West Sacramento Company.

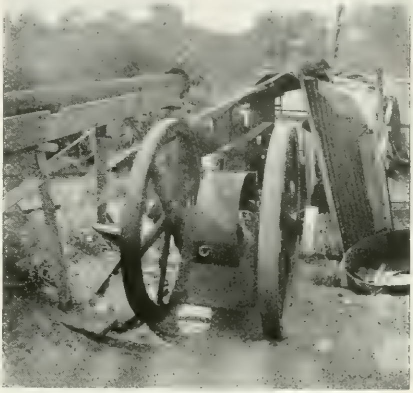
general manager, with instructions to proceed at once in the work of levee construction, drainage and general development work, necessary in an enterprise of this character.

In the promotion of this project the capital of $2,000,000 had first been under-written so that there was immediately available a reasonable supply of cash for every expenditure. "Thoroughness" was the watchword of the Company's instructions, but speed was a requirement, as also was economy. The writer was called upon to study many new conditions. In the course of this study he investigated the methods and the machinery used by other large companies, who had been or were engaged in reclamation work. Some ideas employed by these different organizations were found excellent for use at West Sacramento, but in the case of machinery it was thought and has since been shown that the ordinary mechanical aids could be improved upon.

Particularly was this true of the classes of power in use. Our first endeavor was to discard the horse wherever practicable. Therefore, power-plows, stump-pullers, tractors, caterpillars, motor trucks and automobiles, were provided for the work which had been planned. In this way we eliminated from the start the use of several hundred head of stock. Next came the elimination of wood, coal, gasoline and distillate wherever we found electric energy could be utilized.

Watertight seepage pumping station at Elkhorn

Owing to the perfection of "Pacific Service," in itself operating in our territory through the "West Sacramento Electric," together with the prompt, intelligent and efficient co-operation of every one of its departments, we have gradually eliminated many of the old-time devices for supplying power and in each instance the replacement has meant some sort of electric motor. Our suction dredge is electrically operated, all of our pumps are motor-driven, even our wood is cut with the aid of "juice." Our cooking is done in and on electric ranges; plans for electrically operated plows are being developed; large concrete-mixers in our use are dependent upon "Pacific Service" both for power and for efficiency.



50 H. P. gas engine replaced by 30 H. P. motor

Time and money, these are the two important factors, wherein every possible saving is desirable. When at a cost of $120,000 the Yuba Construction Company built for the West Sacramento Company its twenty-inch suction dredge, it was decided by the writer, after many conferences with Mr. Stanley Walton of the Pacific Gas and Electric Company and some officials of the General Electric Company, that the installation of electrically-operated apparatus would prove both a time-saver and a money-saver, as compared with steam operation. This giant, constructed all of steel, operated by one 750 horsepower motor, one 150 horsepower motor and two or three smaller motors and which is under the direct supervision of Mr. J. W. Wylie, resident manager of the West Sacramento Electric, has justified all conclusions based upon the use of electricity for power. It has been found that the handling of the current of 11,000 volts through a very heavy specially constructed cable, from shore to dredge is more economical than the handling of oil barges could have been. Operating costs are also reduced indirectly in a saving of more than eleven workmen in one twenty-four hour shift. The increased speed which can be given the pump with the specially constructed motors employed, increased the output over an equal steam horsepower, while the excellent lighting, along with added cleanliness and comparatively small amount of dredge apparatus, creates for the year another considerable item of saving.

Again, we have provided for two electric driven 42-inch centrifugal pumps for the main pumping station in Reclamation District No. 900, which comprises the holdings of the West Sacramento Co. The motors here employed are of a special type and will probably be described in these columns by some one more conversant with the subject than the writer. It is calculated that the saving this plant will have over a steam plant will be at least 25 per cent.

To the average person it may be difficult to understand just how any great saving of expense can be realized by replacing steam with electricity in its operation of machines that must be moved from one location to another, but this is easily explained by the fact that the many accessories required where

Steam traction cable-drawn plow operated by the West Sacramento Company steam engines furnish the power are wholly eliminated by the use of electricity. For instance, the steam engines operating the English plows must have water and fuel, hauled by teams. Often several teams must be used to supply just one engine because of the long haul from the base of supply. Calculating the extra cost of horses, wagons and harness, with their repairs and depreciation; add to this the labor involved day in and day out and it will readily be seen that a considerable saving is possible. This applies equally to stump-pullers, concrete mixers and other field apparatus.

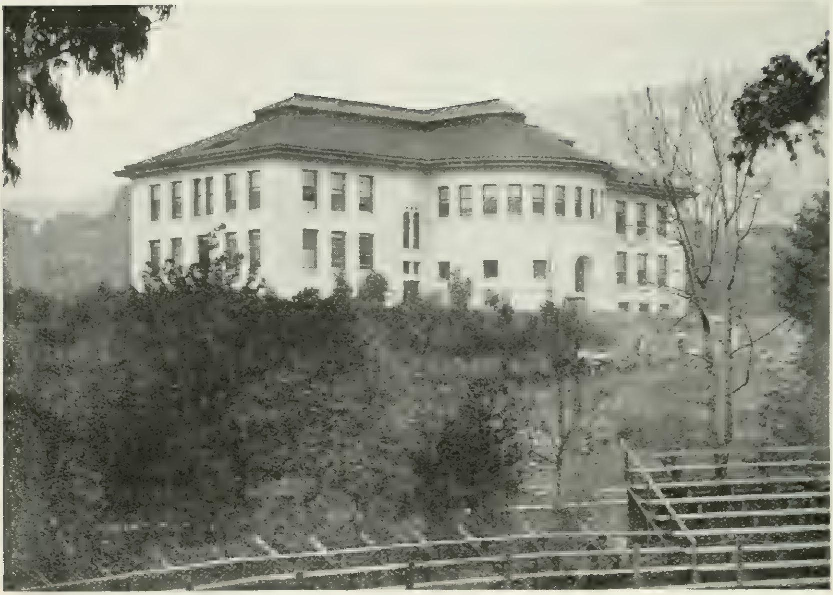
Naturally these results have been possible because we have been able to bring Pacific Gas & Electric power into a conveniently located central station, from which station subsidiary lines converge in every direction across the entire extent of our holdings.

Finally and, perhaps, of most importance because of the permanency of its operation, is the immediate saving the West Sacramento Company is prepared to give its settlers through the West Sacramento Electric, both for lighting and power. This service, combined with the other rapidly progressing economic advantages already mentioned, will make of the West Sacramento Company's holdings one of the most intensively developed electricity-using rural districts in the West. We invite inspection of our work.

The Game

He mounted the steps of a residence swell,
Adjusted his tie and rang the bell;
Then searched the heavens for signs of rain,
While she sized him up through the window pane.
At last she decided to open the door—
"Good morning, Miss, can I see your Maw?
"What! You the mistress here, you say?
"I beg your pardon. Now, tell me pray,
"This lovely child, is she your sister?"
And he grabbed up the kid in his arms, and kissed her.
"Your daughter! Excuse me,—I'll be hung,
"But you ladies in Frisco marry so young!"
"Oh, yes, I'm from the P. G. & E.—
"The time on your meter 's run out, you see,
"So I called to get you to sign again
"For another period of time, and then
"I 'll show how to cut your bills in two,
"With the Mazda lamps—By the way, are you
"Using the 'Hotpoint' iron? Why the power
"Consumed only equals *four cents an hour!*"
She gasped for breath, then started to laugh—
"Young man, you must be a phonograph.
"Come in, sit down and listen to me,—
"I 've got a kick at the P. G. & E.
"Your line of talk, I 'll admit is clever,
"But that bunch down there are the fiercest ever;
"When to use your wires I made application,
"A man came to size up the situation;
"He looked around, then he said, 'Oh, shucks,
"'I 'll *put it in* for fifteen bucks.'
"Now, one year after, that bunch you see
"Are *doing it* absolutely free!
"I paid them enough to buy a hat,
"Young man, now, what do you think of that?
"Your gas is just like yourself, I 'll swear,—
"One part gas and nine parts *hot air;*
"And your 'Hotpoint' lamps and your 'Mazda' iron,—
"Well, to tell you the truth,—I think you 'r lyin'—
"It 's a graft from the time they get you in—
"Yes, it is, and you need 'nt sit there and grin!"

But, he staid on the job till he got her name,
Then bid her good-bye. It 's all in the game.



Headquarters of Activities. The College of Agriculture at Berkeley.

The University Farm School at Davis

An Up-to-Date Institution Encouraged by the Board of Regents and Well Administered by the Faculty

By FREDERICK S. MYRTLE

F. S. Myrtle

In one of the most conspicuously fertile sections of the Sacramento Valley, just north of where the ancient and honorable stream known as Putah Creek divides Solano and Yolo Counties, stands the town of Davis. It is important not only as a farming center but as the junction of the Overland and Shasta main lines of the Southern Pacific. And between the border creek and the town lies a cluster of buildings, shaded by a fringe of trees and, with its surroundings, presenting the appearance of an extensive and highly cultivated farm.

It is that, and more, for it is the University Farm School, an institution praiseworthy to a degree both for its fidelity of purpose, the practical character of its undertaking and the results it achieves. It provides an answer to the problem—What to do with our young men of eighteen or thereabouts who, having a taste for an agricultural life, either do not possess the necessary qualifications or from some other cause are unable to pursue a college course. The University Farm School furnishes technical training in agriculture to these young men and affords them the regular three years' course of study without calling upon them to fulfill the requirements of entrance at the University.

The University Farm consists of 780 acres of fine valley land. The California State Legislature of 1905 provided for the selection and purchase of the land with an appropriation of $150,000, and vested the title to it in the Regents of the University of California, with directions that it should be used for instruction and experimental work in agriculture under the supervision of the College of Agriculture. At each regular session since 1905 the Legislature has made generous appropriations for improvements, buildings, equipment and support. All experimental work is conducted by the Agricultural Experiment Station of the University; it is supported partly by State appropriations, partly by appropriations of the federal government.

Some little time ago the writer took a trip up there in company with Dr. Thomas F. Hunt, the able Dean of the College of Agriculture at Berkeley. It was a most interesting experience, one that revealed much of the thoroughness with which scientific research of all kinds is pursued by the modern college professor. At this School every branch of the agricultural industry is exploited in both its practical and experimental phases, and new discoveries are rewarding those who are devoting their lives to the solution of the agricultural problem to the end that land cultivation may develop into an exact science in which chance and the fortunes of season shall have no say.

In the way of general information we are told that the chief object of the University Farm School course is to give students an understanding of the natural laws which govern plant and animal production and the best methods of agricultural practice. The first year is devoted largely to training in the fundamental sciences, while during the

View of the University Farm School at Davis, from the Road.

Stock Judging, University Farm School.

second and third years a study is made of all of the more important branches of agriculture. The first two years are the same for all students; during the third year choice must be made between groups of studies. The school seeks to train its students for successful living as well as for successful farming. To enumerate some of the principal branches of study:

ANIMAL INDUSTRY.—The study of animals begins in the second year with a course in stock-judging, dairy and beef cattle, sheep, swine, horses and mules. This is accompanied by lectures and practice in the handling and management of live stock. During the third year students who wish thorough training for practical stock-raising are offered further work in the judging and history of breeding, blood lines and pedigrees, feeding and milk production and the elementary principles of veterinary science.

Plant study begins the first year with plant physiology. Botany is taught as a general foundation for other agricultural subjects. This study includes both laboratory and outside work. Botany is followed in the second year by horticulture, while in the third year special instruction is given in viticulture.

CHEMISTRY.—This study includes the

Draught Horses, University Farm School.

scope of general chemistry and, of course, specializes upon the chemistry of plant and animal life.

DAIRY INDUSTRY.—This study includes dairy bacteriology and dairy sanitation.

POULTRY HUSBANDRY.—This is an elective course given in the third year. It takes up all branches of poultry work, including the operation of incubators and brooders. Poultry diseases and methods of dealing with them are also studied.

Judging Sheep at the University Farm School.

SOILS AND FARM CROPS.—Crop production is here taken up with reference both to the plant and to the soil. On the one hand the work includes a study of the relations, adaptability and uses of the more important farm crops, with their habits of growth, methods of cultivation, grading and marketing; on the other hand the course deals in a practical way with the physical and chemical properties of the soil.

IRRIGATION AND SURVEYING.—This includes practice in the use of surveying instruments, land measurement, the planning and laying out of irrigation systems, ditch construction and similar subjects. A part of the farm is actually under irrigation and the practical working of the different methods of applying water to the land is shown.

DRAWING AND SHOP-WORK. — Ten hours a week during the first year is given to practice in instrumental drawing, shopwork in carpentry and forging, and practical work in farm carpentry, concrete, etc.

FARM MACHINERY.—This course aims to convey to the students an idea of what constitutes efficiency in the different types of farm implements. The implements studied include those commonly used in preparing the land, in sowing and harvesting crops; also pumps, engines, motors and tractors.

Besides these studies there are courses in English, History, Civics and Economics, Mathematics and Physics. There is an ample library at the School where may be seen the bulletins and other periodicals of the U. S. Department of Agriculture and the Agricultural Experiment Stations; standard works of reference and valuable books, with papers and magazines devoted to general agriculture or to specialized branches.

There is a general assembly of the student body once a week, when there are talks by instructors, addresses by visitors and practice in public speaking by the students.

All this work, of course, is under the direct supervision of the College of Agriculture, whose dean, Dr. Hunt, runs up to Davis from Berkeley at frequent intervals. Dean Hunt has the confidence of the Board of Regents and these gentlemen set a very high value upon the University Farm School as an aid not only to the education of youth but, also, to the practical development of the State of California, whose fertile valleys offer unlimited prosperity in exchange for intelligent cultivation.

Dean Hunt is an enthusiast, of course. The State University had hard work to get him, for he was doing wonders at the Pennsylvania State College of Agriculture. But he has had no reason to regret the change he was induced to make, for since his arrival here he has been given a free hand by the Board of Regents in his work of organization. Moreover, he has called three of his associates from Pennsylvania to help him, Professor C. F. Shaw of the Department of Agronomy, Professor J. W. Gregg of the Department of Horticulture, and Professor H. E. Van Norman, whose specialty is dairy husbandry, and who has been called to take up his residence at Davis as Dean of the University Farm School.

On our way up to Davis Dean Hunt told me a good many things about his work and its purpose. In the course of his observations he said, "I estimate that there are 90,000 farms in California, each of which should produce a boy equipped for the agricultural course at least once in twenty years; that makes an average of 4,500 a year. I consider that a conservative estimate. Statistics show also that farms change hands on an average of three times a century. So, you see, it is by no means an easy matter to take care of this continuous flow of young men.

"At the present time we have about 420 students taking the course in agriculture at Berkeley and 150 taking the three years' course at Davis. We have also a short course to which students over 17 years of age are admitted without examination. We have about 100 at a time."

Vineyard at the University Farm School.

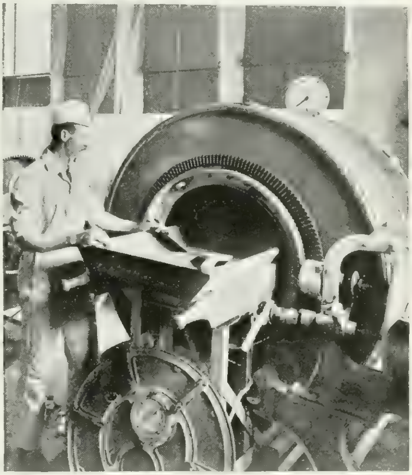
On arrival at Davis it was easy to see that the conditions there had not been overstated. Although not the best season of the year for showing-off purposes everything there was indicative of the highest cultivation. The various branches of study have their headquarters in buildings scattered over the farm territory and each, in turn, proved well worth a visit.

In the livestock department Professor J. I. Thompson showed us the famous Holstein cow, Pieterje Bloom, that has a record of 23,595 pounds of milk and 789 pounds of butter fat in one year. A picture of this famous animal is presented with this article. In an adjacent field we were shown a Southdown wether lamb which won first prize, open class, at the International Livestock Show in Chicago last December. In another place was exhibited a champion Duroc-Jersey sow, that besides winning first championship in the California State Fair, had given birth to ten pigs during the year. Two famous bulls, one huge one a Hereford, one, much smaller, of the Angus breed, attracted attention, also famous stallions and brood mares, each with a history. All the livestock looked the picture of health.

The poultry department, under care of Professor J. E. Dougherty, was interesting. Each student here runs an incubator, prepares his own machine, disinfects it, regulates the temperature and sorts out his eggs both as to size, shape, uniformity of color, etc., and runs them through the three weeks' process of incubating.

In the dairy husbandry division we had the pleasure of seeing the latest developments in butter making, with electric power as the chief aid. Professor Leon M. Davis acted as instructor and showed us over the creamery. He informed us that during the year just closed the amount of butter had averaged 12,000 pounds per month and that it was in great demand due to its uniformity and high quality.

The agronomy department is one of the most scientific at the Farm, for here it is that experimental work is carried on with grain and leguminous crops. Professor A. J. Gaumnitz explained the grouping of wheats and gave us figures showing the results of his experiments in soil-treatment to suit the different varieties.

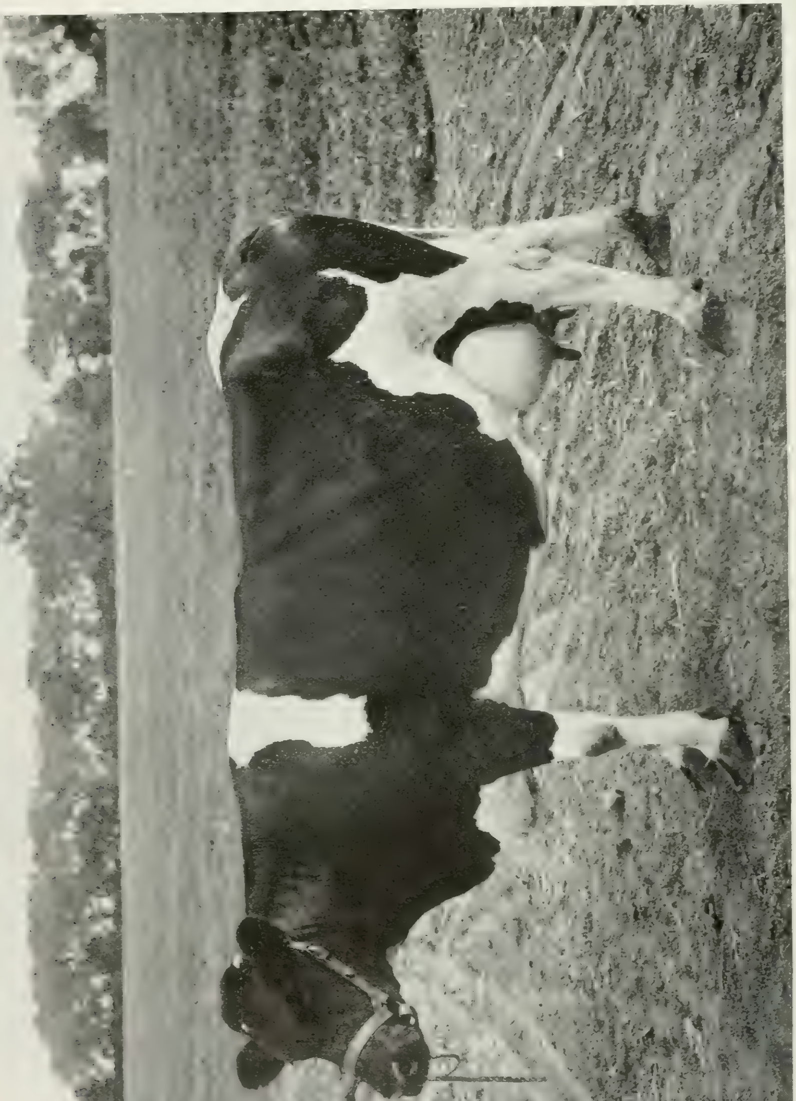


Churning Butter by Electricity.

To one professionally interested in the uses of electric power the irrigation department held much attraction. Here Professor S. H. Beckett has for a long time been engaged in experimenting for the purpose of determining the increase in crops yielded by the ground from the application of water. All kinds of crops are made the subject of experiments, wheat, oats, barley, corn, alfalfa and sugar beets, etc., and in each instance the experiments have resulted in some amazing disclosures.

It is worthy of note here that Professor Beckett's chief assistant is a 7½ h. p. motor, single phase, and it is worthy of note that this was installed by "Pacific Service." Our company, by the way, has the contract to furnish the electric "juice" for the entire undertaking at Davis.

The students' quarters interest the visitor not a little. There is ample room for all



The University Farm School's Prize Holstein Cow, Pieterje Bloom. She has a record of 23,595 pounds of Milk and 789 pounds of Butter Fat in one year.

taking the three years' course. The dormitories are airy, the dining hall well equipped, the social halls inviting. The annual cost per student for board, room, fees and books is not over $250. The school year begins September 10th and continues to May 10th, with a two weeks' recess at the winter holiday time.

Treating Pear Tree for Pear Blight.

The Farm School at Davis is but one of the activities controlled by the College of Agriculture. There are various experiment stations, located, respectively, on the Kearney Estate near Fresno, comprising about 5,500 acres of land laid out in vineyards, orchards and alfalfa farms; the Citrus experiment station at Riverside, center for graduate instruction in tropical agriculture; the experiment station at Meloland, Imperial County; the Plant pathological laboratory at Whittier, Los Angeles County, and two Forestry stations, one at Santa Monica and the other at Chico.

The central feature of all these activities is to be found on the University campus at Berkeley in a modern white granite structure where the administrative offices are located. Here Dean Hunt sits, surrounded by a staff of clerks, a very busy man. Some idea of the amount of detail which his work involves may be gathered from the fact that from October 7th to January 13th, he received 5,824 letters, postcards, etc., and sent out 111,000 pieces of mail matter, including bulletins and reports. His specialty is organization and, needless to say, he keeps a directing hand upon the entire machinery of his department.

I asked him if he would write me a few notes of a general character concerning the work of the Agricultural Experiment Station. He responded with the following:

"Science has proven to be an indispensable factor in furthering the progress of agriculture. The achievements in agriculture science, however, have done scarcely more than to suggest the possibilities of future development. The Station looks back over an honorable record of thirty-seven years under the direction of Hilgard and Wickson, during which period a fundamental ground work has been laid that it is believed will be enduring. Particular features of this basic work of the Station include the demonstration of the distinctive characteristics of the soil of semi-arid climates as manifested in California, including unique discoveries of the operation of soil organisms; demonstration of the value and utilization of alkali lands through proper reclamation methods; also demonstrations bearing on the economical use of water and the development of better methods of the application of water in orchard and vineyard practice. In the field crops there has been demonstration of improved methods of culture, together with the production of improved varieties or select strains of cereals, which are a basis for building up vastly increased production.

"It is difficult to properly express the wide influence that has been exerted by the experts of the College of Agriculture on horticultural practice not only in this State, but elsewhere in the United States, and also in the most remote countries of the world where the California form of fruit tree is now recognized as embodying peculiarly desirable characteristics. The work has also been unique in having a station devoted exclusively to the investigation of the culture of citrus fruits and in the fact that in California has been found the only College of Agriculture in America having a distinct department of the grape and its products.

"Among the many definite acts of service to the producers of the State, foremost in the field of plant disease control should be mentioned the control of the asparagus rust, the discovery of the cause and control of the Brown Rot of citrus fruit,—a disease new to science and horticulture before its appearance in southern California about seven years ago. The maintenance of a special laboratory and fields for the study of plant diseases has been a constant defense against these serious sources of loss to plant growers.

Dentistry Upon Decaying Fig Tree.

"Certain methods of control of injurious insects have been developed by the Station, which have been adopted generally not only throughout California, but also in other states, and, in some instances, even in other countries.

"California was the first state to provide *effective* legislation for the control of the chemical composition of insecticides, which was based upon the work of the California station and is now in wide and beneficent operation.

"Metabolism experiments with nuts and fruits as human food have clearly demonstrated the great value of these elements of human diet. Execution of State Laws controlling the purity of the food of the people has been made possible through co-operation between this Experiment Station and the State Board of Health. Based upon the work of the Station also, the Legislature provided for the control of hog cholera by the manufacture and distribution of immunizing serum to all parts of the state.

"Bulletins are available for distribution and will be sent free upon request to any citizen of the state who may request the same. Address Director Agricultural Experiment Station, University of California, Berkeley."

Some idea of the scope of the activities prosecuted under the direction of the College of Agriculture may be gathered from the following list of names comprising the Agricultural Staff:

Benjamin Ide Wheeler, Ph. D., L L. D., President of the University of California; Thomas Forsyth Hunt, D. Agr., D. Sc., Dean of the College of Agriculture, Professor of Agriculture, and Director of the Agricultural Experiment Station.

Leroy Anderson, Ph. D., Professor of Dairy Husbandry; W. H. Arnold, B. S., Instructor in Chemistry and Botany, Davis; E. B. Bagcock, M. S., Assistant Professor of Agricultural Education, H. S. Baird, B. S., Assistant in Dairy Industry, Davis; G. Barovetto, Viticultural Assistant, Davis; S. H. Beckett, B. S., Instructor in Irrigation, Davis; H. L. Belton, Instructor in Shop Work, Davis; F. T. Bioletti, M. S., Associate Professor of Vitaculture and Viticulturist. F. H. Bolster, B. A., Instructor in Botany and Horticulture, Davis; L. Bonnet, I. A., Instructor in Viticulture, W. W. Bonns, M. S., Assistant Professor of Promology, Riverside; J. C. Bridwell, B. S. Instructor in Entomology; D. L. Bunnell, Secretary to the Director; J. S. Burd, B. S. Associate Professor of Agricultural Chemistry, in charge of Fertilizer Control; P. S. Burgess, M. S., Instructor in Soils; W. T. Clarke, B. S., Associate Professor of Horticulture and Superintendent of University Extension in Agriculture; A. M. Cleghorn, B. A., Principal University Farm School, Davis; J. E. Coit, Ph. D., Professor of Citriculture; G. E. Colby, M. S., Assistant Professor of Agricultural Chemistry, in charge of the Laboratory of Agricultural Chemistry; G. A. Coleman, Curator of the Entomological Museum; W. V. Cruess, B. S., Assistant in Zymology; L. M. Davis, B. S., Assistant Professor of Dairy Industry; J. D. Denny, Foreman in Cereal Work, Kearney Park, Fresno; W. H. Dore, B. S., Chemist in Fertilizer Control; J. E. Dougherty, B. S., Assistant Professor of Poultry Husbandry, Davis; B. S. Etcheverry, B. S., Irrigation Expert; F. C. H. Flossfeder, Instructor in Viticulture, Davis; A. J. Gaumnitz, M. S., Instructor in Agronomy, Davis; C. R. George, B. S., Instructor in Animal Husbandry, Davis; W. F. Gericke, B. S., Instructor in Soils; J. W. Gilmore, M. Sc., Professor of Agronomy, G. P. Gray, M. S., Chemist in Insecticide Control, J. W. Gregg, B. S., Professor of Floriculture and Landscape Gardening, F. L. Griffin, M. S., Instructor in Agricultural Education, E. H. Hageman, Instructor in Dairying, Davis; H. M. Hall, Ph. D., Assistant Botanist; C. M. Haring, D. V. M., Assistant Professor of Veterinary Science; W. B. Herms, M. A., Assistant Professor of Applied Parasitology; P. L. Hibbard, B. S., Instructor in Agricultural Chemistry; E. W. Hilgard, Ph. D., LL. D., Professor of Agricultural Emeritus; W. T. Horne, B. Sc., Assistant Professor of Plant Pathology; W. G. Hummel, M. S., Assistant Professor of Agricultural Education; Thos. Francis Hunt, B. S., Plant Pathologist; R. C. Ingrim, Instructor in Shop Work, Davis; Mrs. Adele S. Jaffa, M. D., Lecturer in Dietetics; M. E. Jaffa, M. S., Professor of Nutrition; Jas. Koeber, Instructor in Farm Mechanics; Katherine Jones, B. S., Assistnat in Agricultural Education; E. J. Lea, M. S., Assistant Professor of Agricultural Chemistry; C. B. Lipman, Ph. D., Associate Professor of Soils; R. H. Loughridge, Ph. D., Professor of Agricultural Chemistry, Emeritus; Anna M. Lute, A. B., Seed Tester, U. S. Dept. of Agriculture (in Co-operation); B. A. Madson, B. S. A., Instructor in Experimental Agronomy; F. R. Marshall, B. S. A., Professor of Animal Husbandry; C. H. McCharles., M. S., Instructor in Agricultural Chemistry; W. M. Mertz, Assistant in Pomology, Riverside; M. R. Miller, B. S., Assistant Chemist, Insecticide Laboratory; J. F. Mitchell, D. V. M., Assistant in Hog Cholera Immunization; Earl Morris, Field Assistant in Santa Clara County; J. F. Neff, Conductor of Farmers' Institutes in Southern California; W. E. Packard, M. S., Experimental Agronomist, in charge of Imperial Valley Station, El Centro; W. G. Perrine, Superintendent of Greenhouses and Gardens; H. J. Quayle, M. S., Assistant Professor of Entomology; C. L. Roadhouse, D. V. M., Instructor in Veterinary Science; S. S. Rogers, B. S., Plant Pathologist, Whittier; W. A. Setchell, Ph. D., Botanist; A. B. Shaw, B. S., Assistant in Entomology; C. F. Shaw, B. S., Professor of Soil Technology; G. W. Shaw, Ph. D., Associate Professor of Experimental Agronomy; C. O. Smith, M. S., Instructor in Plant Pathology, Whittier; Elizabeth H. Smith, M. S., Instructor in Plant Pathology; R. E. Smith, B. S., Professor in Plant Patholcgy; Mattie E. Strover, B. S., Assistant in the Agricultural Chemistry Laboratory; A. V. Stubenrauch, M. S., Professor of Pomology; R. H. Taylor, B. S., Instructor in Horticulture, Davis; C. M. Titus, M. A., Instructor in Mathematics, Davis, E. E. Thomas B. S., Assistant Chemist, Whittier; J. I. Thompson, B. S., Assistant Professor of Animal Husbandry; A. R. Taylor, B. S., Assistant Plant Pathologist, Whittier; H. E. Van Norman, B. S., Dean of the University Farm School, Davis and Vice-Director of the Agricultural Experiment Station; W. H. Volck, Field Assistant in Monterey County; A. E. Way, Field Assistant in Viticulture, Fresno; H. H. Warner, Student Assistant in Plant Breeding; H. J. Webber, Ph. D., Professor of Plant Breeding, Director of Citrus Experiment Station; Dean of the Graduate School of Tropical Agriculture, Riverside; E. J. Wickson, M. A., Professor of Horticulture; C. J. Wight, B. S. Instructor in Botany and Horticulture, Davis; F. H. Wilson, B. S., Assistant in Soils; C. W. Woodworth, M. S., Professor of Economic Entomology; H. D. Young, B. S., Assistant in Agricultural Chemistry, Whittier.

So, its a vast undertaking, and one which reflects the greatest possible credit upon the State University and the Board of Regents whose broad progressive policy has made it possible.

As this issue goes to the printer we receive the welcome news that the State legislature has appropriated the sum of $1,020,000 for the use of the College of Agriculture in aiding its great work of development during the ensuing two years.

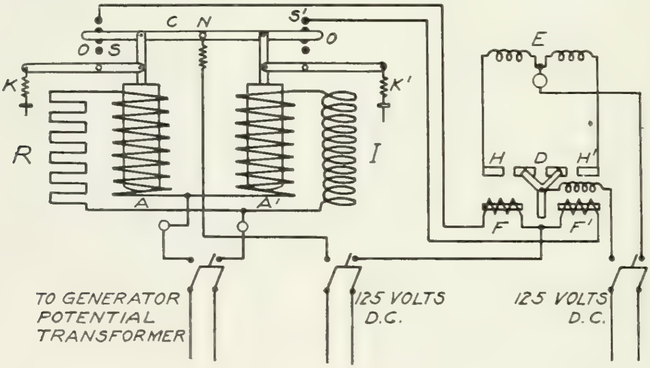
The Development of Automatic Regulation for Turbo-Generators

By THOS. E. FOGALSANG, Department O. & M. Steam Plants.

T. E. Fogalsang

In days gone by, when alternator running and parallel operation were troubles by day and bugaboos by night for the engineering fraternity, it was not an uncommon event while visiting the engine room of a central station to see the engineer changing the speed of his engines by adding to or taking weights from the arm of the governor, the while intently gazing at a red-colored incandescent lamp on the guage-board near by.

On the top of the cylinder, piled near at hand, were assorted weights of various sizes, consisting of nuts, washers and pieces of old iron. From time to time, at the sign of a certain wink of the lamp which was operated from the switchboard on another floor, the engineer selected a piece of certain size and hung it on the governor arm. When the signaling ceased the engineer knew that the speed required by the operator was established, and it was thus allowed to remain. As in the days of Stevenson, when a desire to be at play, instead of pulling a string back and forth to operate a slide valve, caused the boy to do something that led to the adoption of the eccentric motion, so subsequent events led to the evolution of a weight on the governor arm that was run back and forth by a small electric motor, controlled from the switch board.



This idea solved the problem of governor control, and now every generating unit, whether it be steam, water or gas-driven, is handled from the switchboard. After speed control came automatic voltage regulation, which has taken a step far in advance of the former. Today, the voltage-regulator is so perfect that with the slightest change in load conditions the regulator changes the potential to correspond. Hand-regulation has become a thing of the past, but, thus far, not so with speed-regulation.

If a large unit is running along with a certain load, and more comes on, a drop in frequency takes place, unless the operator is at hand to note the changed condition and correct the same by operating the governor-motor. If the governor is not adjusted, the machine continues to operate at this lower frequency.

Thus the question naturally arises, if the voltage can be automatically adjusted and maintained constant as the load changes, why not the frequency also?

It appears like good logic, and the Department of Operation and Maintenance of Steam Plants has for some time endeavored to get manufacturers interested. They have admitted that such a thing is possible, but have offered one excuse or another as to whether such an instrument would have a large sale, and whether conditions call for it. It's a long way from the manufacturer to the operating engineer, but its usually the latter that is really the final designer of perfect apparatus.

Sometimes it takes years to successfully thresh out all the "bugs" that develop after apparatus is put into operation. It's the operating engineer who does the picking all this time. It's his company's good cold cash that's paying for the discoveries, and in the end it's the manufacturer who reaps the benefit. The next piece of apparatus manufactured bears the earmarks of all these discoveries, but at advanced prices usually.

To start thought working along the lines of automatic control and regulation of frequency this department presents an idea for the development of a frequency meter that will be to governor-motor control, just what the contact-making volt-meter is to the potential regulator. We hope that from this crude idea someone may help to develop such an instrument. This will be the last step to make our turbo-generators entirely automatic.

The oil to the step-bearing will be regulated by an automatic pump, the voltage will be maintained constant by a Type T. A. or Tirrel Regulator, while the frequency will remain the same, due to the workings of such a control as is not yet developed, but possible.

In the sketch is represented a double coil voltmeter, "A", connected to the potential transformer through non-inductive resistance "R", and "A^1" connected to same through inductive resistance "I". The torque of element "A" will increase with the frequency, while that of "A^1" will decrease.

At the setting for normal cycles a balance will maintain and no contact will be made at either point "S" or "S^1" as switch "N" will be on a balance. If the frequency changes, then the torque of the coils will change and make a contact at either point "S" or "S^1". This will excite the magnets "F" or "F^2" of the relay, which in turn will make contact at "H" or "H^1" with "D", and the series motor "E" on the governor will be run ahead or back as the case may be.

Adjustments can be made at "K" and "K^1".

IN MEMORIAM—FRANCIS PARKER

It is with sadness and sorrow that we report the death of Francis Parker.

Frank was one of the oldest men in the employ of the San Francisco District, holding practically the same position for about twenty-three years.

His position began with the creation of the Edison Light and Power Company of San Francisco, and his department was maintained with such efficiency and exactness that not only has the Company sustained a loss by his death, but Station "A" men, from the highest position to the lowest, feel deeply his passing away.

F. H. VARNEY.

The Manufacture of Water Gas

A Lecture Delivered at the University of California

By E. C. JONES

E. C. Jones

Since 1784 when Cavendish discovered that hydrogen was one of the components of water, the decomposition of water has been studied by chemists in the laboratory, and gas men have striven to make practical use of their experiments to cheapen the cost of producing gas. From the time that Lavoisier passed steam through a red hot tube containing charcoal and obtained an inflammable gas, until the advent of the internally fired generator, the work of the inventor was along the lines of the first discoveries, which comprised the dissociation of steam by contact with heated carbon contained in externally heated retorts. The processes were numerous, the theory of water gas was recognized, and its desirability as a substitute for coal gas was admitted, but every effort was a commercial failure.

It required the mind of a genius to grasp the theory of water gas, and develop it along original lines. This was the work of Prof. T. S. C. Lowe, who in 1872 invented the internally fired generator, used in connection with a superheater filled with refractory material, and made use of secondary combustion for heating this material. Professor Lowe was the "Father of Water Gas." His discoveries were revolutionary, and the work of his predecessors hindered rather than helped him to achieve his great success.

The first water gas plant was built and started by Prof. Lowe in February, 1874, in Phoenixville, Penn., and this was the beginning of a new era in the gas industry.

The greatest builders of water gas apparatus in the world describe the Lowe patents of 1872 and 1875 in these words:

"The basic principles involved were the use of a generator and superheater, both shells lined with fire brick; the former being provided with grate bars, air blast, and steam connections; the latter being filled with loosely piled checker brick to give fixing surface. In the generator, non-luminous water gas was produced by the dissociation of steam in contact with carbon (in form of anthracite coal), previously heated to incandescence by means of a forced blast of air. The superheater was brought to a suitable temperature for breaking up and fixing oil vapors by the combustion within it of the carbonic oxide formed during and by the passage of the air blast through the fuel in the generator. Oil, or oil vapors were introduced into the superheater coincident with the generation of the non-luminous water gas in the generator, and by contact with the heated fire brick surfaces the oil vapors were gasified and fixed, in the presence of the non-luminous gas and during their passage together through the superheater. The process is, necessarily, intermittent; first a period of blasting to bring the carbon in the generator to the proper temperature, and by complete combustion of the blast gases in the superheater to bring the checker brick to the proper temperature for fixing the oil vapors; second, a period of gas production."

This invention is the basis of all forms of water gas apparatus now in successful use and an eminent gas engineer in discussing the subject is recorded as saying:—"The credit for the invention of the process whether considered chronologically, practically or legally, belongs unquestionably to Prof. T. S. C. Lowe."

The best preparation for a comprehensive knowledge of water gas, is a careful study of the principles of combustion. Water gas, sometimes called "blue gas," because it burns with a non-luminous flame, is made by the decomposition of steam in the presence of incandescent carbon.

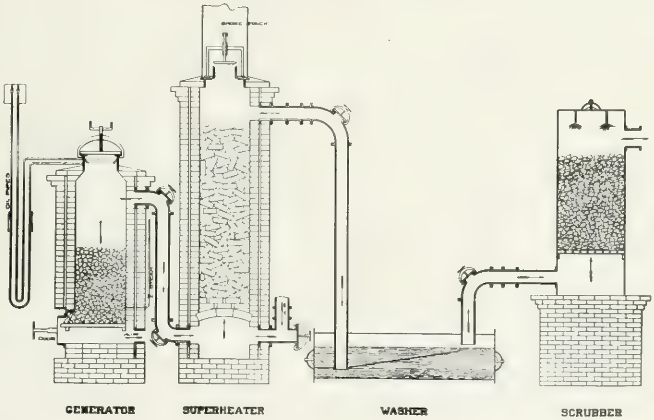
To get carbon in this condition it is necessary to place some form of carbon, usually anthracite coal or coke, on a grate in a simple form of generator. This fuel is ignited and could be raised to the desired temperature by natural draft, but this would be too slow.

To economize time and energy, a forced blast of air is applied to the fuel, the air entering below the grate. Air consisting of oxygen and nitrogen impinges on the heated surface of carbon, and the oxygen unites with the carbon to form CO_2. If the amount of air is excessive and the fuel bed is shallow, the reaction ends here and the fuel is burned to ash, but if the air supply is regulated and the fuel bed is deep, the temperature of the carbon is raised and a further reaction takes place. $CO_2+C=2CO$. This is generator gas, and is commercially called producer gas.

This gas issuing from the top of the fuel bed is met by a secondary air blast and the CO is burned to CO_2 and the resultant heat is stored in the checker brick to be used for vaporizing oil.

The nitrogen in the air is inert and plays no active part in the heating process. Prof. Lowe aptly called nitrogen "a thief of heat."

FIRST FORM OF
LOWE WATER GAS APPARATUS
1875



The generator gas always contains a small amount of hydrogen due to the moisture in the fuel, and to the use of steam under the grate bars during the blowing period. A small amount of steam used in this way increases the heating value of the generator gas, and at the same time protects the grate bars and prevents the formation of clinker in the fuel bed.

The incandescent carbon is now ready to dissociate steam. During the blasting period the final products of combustion pass out into the atmosphere through a stack valve. After the air blast is shut off this stack valve is closed and the only outlet from the apparatus, for the escape of gas, is through a wash box provided with a dip-pipe and hydraulic seal.

To make gas, steam is admitted below the grate bars and passing upward comes in contact with the heated carbon.

(Carbon) $C+H_2O$ (Steam) $= CO+H_2$

This would be ideal water gas containing 50% hydrogen, and 50% carbonic oxide, but conditions are never perfect and some CO_2 is formed. There are also small percentages of marsh gas, oxygen and nitrogen in the water gas. A typical analysis of the blue gas would be about as follows:

CO	=	39.75
H_2	"	50.00
CH_4	"	2.20
CO_2	"	4.60
O_2	"	.35
N_2	"	3.10
		100.00

This gas contains 322 British thermal units per cubic foot.

If it were possible to produce ideal blue water gas by dissociating steam in the presence of incandescent carbon, 1,000 feet of the gas would consist of 500 cubic feet of hydrogen and 500 cubic feet of carbon monoxide.

24 pounds of water would be required to produce the 500 cubic feet of hydrogen, which would weigh 2.66 pounds, and 250 cubic feet of oxygen, weighing 21.34 pounds.

16 pounds of carbon would produce 500 cubic feet of carbon vapor that combines with the 250 cubic feet of oxygen producing 500 cubic feet of carbon monoxide.

This perfect gas would have a specific gravity of .531 and 1,000 cubic feet would weigh 40 pounds.

When steam is passed through a body of highly heated carbon, the composition of the gas generated varies with the temperature of the carbon, the rate of flow and quantity of steam and the depth of the fuel bed. At temperatures about 1100° Fah. the reaction is $C+2H_2O=CO_2+2H_2$ the amount of carbonic oxide being very small. When the temperature of the carbon exceeds 1800° Fah. the reaction is nearly $C+H_2O=CO+H_2$. The following table shows the percentage composition of gas produced by passing steam through carbon heated to different temperatures:

*Temp. of Carbon				Hydrogen	Carbon dioxide	Carbon monoxide
600°	C.	1200°	Fah.	60%	30%	4%
700°	"	1292°	"	65%	29%	6%
800	"	1472°	"	62%	23%	15%
900°	"	1652°	"	54%	7%	39%
1000°	"	1832°	"	50%	2%	48%

Water gas made in the generator as described is non-luminous, and almost without odor, and it must not be confounded with the same gas after it has been carburetted and has illuminating power and an odor as pronounced as that of any other illuminating gas. The name "blue gas" is used to distinguish this gas from the finished product, and manufacturers invariably speak of the finished product as carburetted water gas. Unfortunately water gas was not immediately accepted by the coal gas companies, and the only way it could get a footing was by competition in the lighting business. This was considered piracy by the old gas companies, and while the name "water gas" was an excellent advertising feature, giving an impression of cleanliness and cheapness, it was subject to attacks on the ground that it was poisonous and without odor. The antagonists of water gas did not differentiate between water gas which is a poor heating gas with no illuminating

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*Thorpe's Dictionary of Applied Chemistry.

power, and carburetted water gas which has both high heating and illuminating value.

A ton of anthracite coal in the generator produces about 40,000 cubic feet of blue gas, and the blasting process to get the coal in condition to dissociate steam yields about 150,000 cubic feet of producer gas having a heating value of something less than 100 British thermal units per cubit foot. If this producer gas is wasted, the process cannot be a commercial success for the blue gas contains only about one-half of the heat units of the carbon from which it was made. It was the useful application of the producer gas to the heating of checker brick contained within the same apparatus that solved the problem of economical carburetted water gas making.

Contemporaneous with the experiments of Lowe other inventors were engaged in the work of designing apparatus for the manufacture of non-luminous water gas and carburetting it in a separate apparatus.

The most notable of these was the Tessie du Motay system, first installed for gas making at the works of the Municipal Gas Company of New York in 1876.

In this apparatus the blue gas was made in the usual form of simple generator called a "gasogene," consisting of a fire brick lined shell, provided with a grate on which rested a bed of fuel. The process included blasting the fuel and wasting the products of combustion into the atmosphere, and then passing steam through the heated fuel bed thus forming non-luminous water gas. This gas was conducted out of the gasogene to a carburetter containing pans of naphtha heated to a vapor by steam. The gas enriched by naphtha vapor and carrying it in suspension, was then conducted to a series of heated retorts where the gas was "fixed" or made into a permanent gas. This process for making gas was wasteful in its method of generating the blue gas, and it is obvious that the carburetter and retorts required heating by means entirely independent of the generator fuel. The du Motay process is mentioned here to emphasize the importance of the discoveries of Lowe.

In the modern water gas works all the fuel for gas making is used in the generator, and the only secondary fire is under the boiler for producing steam; this is necessary in any kind of gas works.

In studying the reactions which take place in a water gas generator, there is apparently a sacrifice of heat in converting carbon to carbon monoxide when compared to the results obtained by burning the carbon directly to carbon dioxide, and many attempts have been made to supply non-luminous water gas to consumers to be used as fuel gas or by the use of incandescent gas burners for illumination.

In every instance these ventures failed because the non-luminous water gas containing about 300 British thermal units per cubic foot cannot compete with the poorest illuminating gas that is made and distributed. It is now an accepted fact that free hydrogen is not the most desirable element in a fuel gas, and that mixtures of hydrogen and carbon monoxide never contain over 350 British thermal units per cubic foot, while a satisfactory gas to be used for all purposes should contain at least 500 British thermal units per cubic foot.

This completely eliminates non-luminous water gas in the consideration of a gas suitable for distribution as fuel for domestic use in the present state of the art. As recently as 1898 there was a revival of interest in blue water gas when Carl Dellwik invented improvements in its manufacture which briefly consisted in using the simplest form of generator with a shallow fuel bed. The air blast is increased in volume and velocity, so that the blast period is reduced to about three minutes. In this way the combustion of carbon is complete, and the products of combustion consist of CO_2 and N_2. Steam is introduced below the grate bars passing up through the fuel, and is dissociated into blue gas and in each alternate run the steam is admitted above the bed of fuel, passing downward through it. This method of operating is known to gas men as up and down runs.

It is claimed for the Dellwik process that the water gas produced utilizes 79% of the fuel carbon. This gas is well adapted to metallurgical work, but for domestic lighting, heating and cooking, it is necessary to carburet the gas in a separate apparatus using additional fuel to obtain the necessary heat. The du Motay antedated the Dellwik process by over twenty years, and the writer has often wondered if the eminent gas engineer under whose supervision the du Motay plant was operated in New York in 1876, did not discover and make use of all the advantages claimed for the Dellwik process.

Having described the generation of the non-luminous water gas, the next step is to carburet the gas for the purpose of giving it illuminating power and increasing its heating value.

The early Lowe apparatus consisted of a generator connected at the top by a pipe leading to the base of a superheater. The superheater is a fire brick lined shell, longer than the generator and filled with fire brick thrown in loosely. At the bottom of the superheater, secondary air is admitted for combustion of the generator gas for heating the brick. After the generator fuel has been blasted to the desired heat, and the bricks in the superheater are at the required temperature, the air blast is shut off and the stack valve is closed. Heated oil is then sprayed into the top of the generator above the fuel bed, and mingling with the blue gas passes with it into the superheater. In its passage through the superheater in contact with the heated brick, the oil is vaporized and then converted into a fixed oil gas. At the same time it is thoroughly mixed with and becomes a part of the blue gas. This is called carburetted water gas. In the early days of water gas, naphtha was used for carburetting and the apparatus was designed for its use.

There was then little demand for naphtha and it was the only product of the distillation of crude petroleum for which there was little use, and which the oil refiners found it difficult to get rid of. This new use for naphtha opened a field for the disposal of an unwelcome product. Water gas of 23 candle power required about five gallons of naphtha per thousand cubic feet for enrichment. The increasing cost of naphtha compelled gas manufacturers to look for a substitute, and by improvements in pre-heating oil and in the methods of using it, the crude oils of Ohio came into use. The crude oils of the eastern states have a paraffin base, and their value for refining is so great that it makes the cost of these oils for water gas enrichment prohibitive.

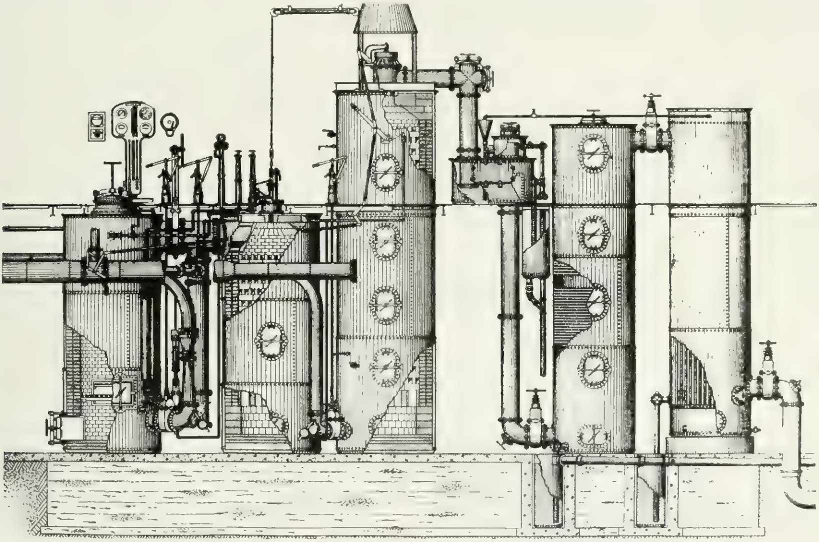
The oil now used for carburetting water gas is a by-product in the distillation of crude oil, for which there is little demand for other purposes. This is known as "gas oil." The crude oil of California, with its asphaltum base, is unattractive to refiners, but is well suited to the carburetting of water gas. Probably the first improvement in water gas apparatus was the use of "checker brick" in the superheater. This consisted in arranging fire brick in regular rows on edge, and spaced about two inches apart. Each course of brick being at right angles to the course next above and below it. This regular arrangement superceded the use of loosely piled brick and has many advantages over the old way. Checker brick may be heated more uniformly, are not so liable to become clogged with carbon, and are easier to keep clean.

Many forms of water gas apparatus embodying the essential features of the Lowe invention found favor with some of the gas manufacturers both east and west. Among these was the Springer process, whose distinguishing feature was a generator and superheater entirely enclosed in a single shell. The checker brick being sustained by arches above the fuel bed. This was the type of apparatus first installed for water gas making in San Francisco. Among the advantages claimed for this method was economy of fuel.

The most important improvement in water gas apparatus was the addition of a second super-heater. This was done by the United Gas Improvement Co., of Philadelphia, and the improved set is known as the "double superheater apparatus" which has become the standard in water gas practice.

In this apparatus the first superheater is known as the "carburetter" and the heated oil is admitted to the top of the carburetter instead of the top of the generator as in the earlier form, when it was the practice to introduce oil in four streams. The oil and blue water gas intermingle and pass through the carburetter and the second superheater and are permanently fixed. The double superheater affords a much greater surface of heated brick for fixing the gas than the single one, and both the carburetter and superheater are heated by the products of partial combustion of the fuel from one fire bed.

The use of the two superheaters permits a range of temperatures which would not be possible in a single superheater, and it is therefore possible to successfully use oils of different densities and of complex compositions.



STANDARD DOUBLE SUPERHEATER, LOWE WATER GAS SET.

The material used for water gas manufacture is governed by local conditions. In the eastern states anthracite coal is the best form of carbon for generator fuel, but when water gas is made as an auxilliary to coal gas, it is economical to use gas coke for this purpose.

In California an anthracite coal imported from Swansea, Wales, was first used, mixed with English oven coke, until it was discovered that there was no advantage in using mixed fuels, and Welsh anthracite was used alone. During periods when the supply of gas coke exceeded the demand this coke was also used in the water gas generators of Pacific Coast cities.

The following analyses will give an idea of the relative composition of these fuels:

	Moisture	Volatile Matter	Fixed Carbon	Ash	Sulphur
Pennsylvania Anthracite	2.98	3.38	87.13	5.86	.65
Welsh Anthracite	2.25	6.01	89.84	1.20	.70
Colorado Anthracite...	3.42	8.76	78.87	8.30	.65
Conl'sv'le Coke (oven)	.88	.67	87.05	10.60	.74
Gas Coke	3.50		87.05	7.50	1.95

When water gas was first made on the Pacific Coast the only available oil was a distillate of 38° B. which cost $3.00 per barrel. This was afterwards supplanted in the larger cities by an excellent quality of crude oil of 36° B. brought from Peru. Then came the wonderful oil discoveries in California, including the crude oil from Coalinga, this, with distillates from other crudes provided good enriching material at moderate cost.

The only water gas now made on the Pacific Coast is in the largest plants where there is an excess quantity of lamp black, which is a by-product of oil gas manufacture.

This lamp black may be used in bulk in its crude state, or better, made into briquettes depending on its own volatile matter as a binder. This fuel is used in an ordinary water gas generator in the same way as coal or coke, excepting that the blast pressure is considerably less. The pressure of air for blasting rarely exceeding nine inches of water. The ordinary crude oil of 14° B. with asphaltum base is used for carburetting with fairly good results.

After carburetted water gas leaves the set, it passes to a wash box containing a hydraulic seal to prevent the return of the gas to the generator, it is then scrubbed and condensed for the purpose of reducing the temperature and removing tar in a manner similar to that employed in coal gas manufacture.

As water gas contains no ammonia, the scrubbing of the gas is simple and it is not customary to save the water used for scrubbing, unless through scarcity or high price of water it is cooled and used over again. The removal of the tar prepares the gas to be purified. The making of water gas is an intermittent process consisting of the blowing followed by the gas making period, and as gas is made only a portion of the time, it is the practice to conduct the gas from the outlet of the scrubbers to a gas holder, known as a relief holder. This holder acts as a receiver for the intermittent runs of gas and permits the purifiers to be operated continuously. The gas is drawn from the relief holder by an exhauster and is forced through the purifiers and station meter into the storage holder.

Water gas is usually purified by oxide of iron the same as coal gas. The only by-product recoverable from the manufacture of water gas is a small quantity of tar, known as water gas tar. This varies in quantity with the composition of the oil used, and the heats employed to gasify it. The average quantity of tar made is about one-half gallon to every thousand cubic feet of gas.

The following table shows the formation of carburetted water gas using anthracite coal as fuel in its progress through the generator, carburetter and superheater.

*	Top of Generator	Base of Carburetter	Middle of Superheater	Top of Superheater
Illuminants ...	.00	10.75	14.75	14.75
Carbon Monoxide ..	39.75	33.05	30.70	30.65
Hydrogen	50.00	43.05	34.60	31.35
Marsh gas	2.20	1.10	12.30	16.75
Ethane (C_2H_6)	.00	5.60	1.45	.30
Carbon dioxide	4.60	4.00	3.70	3.70
Oxygen	.35	.30	.30	.30
Nitrogen	3.10	2.15	2.20	2.20
	100.00	100.00	100.00	100.00

By the application of skill and the results of scientific research the fuel and oil now used to produce carburetted water gas is reduced

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* W. H. Fulweiler.

to nearly the lowest possible point. At Phoenixville the first gas made required 74 2/3 lbs. of anthracite coal for each 1,000 feet, and 4 4/15 gallons of oil for an 18 candle gas. The fuel was high, but the oil was low for the reason that it was thought that water gas with an equivalent of candle power to coal gas would be satisfactory. It was afterwards determined to raise the candle power of water gas for competitive purposes and the amount of oil used was increased to about five gallons per 1,000 feet. The specific gravity of coal gas is .435, while the specific gravity of carburetted water gas is .630. The water gas flame is therefore of much less area per candle. An 18 candle power coal gas burned through an open flame burner has the same flame area as a 23.5 candle carburetted water gas flame. Each burner consuming gas at the rate of 5 cubic feet per hour. As the light emitting surface has much to do with illumination, it will at once be seen why it is necessary to have carburetted water gas of higher candle power than coal gas to produce the same effect.

On the Pacific Coast, using Welsh anthracite coal and Peruvian crude oil in a double superheater apparatus, carburetted water gas of 27.6 candle power was produced with 4.36 gallons of oil and 39.6 lbs of coal per thousand cubic feet, exclusive of boiler fuel.

A brief statement of the most recently obtained results is taken from a paper read by O. B. Evans at the seventh annual meeting of the American Gas Institute, on the subject of "Heat Balance of a Carburetted Water Gas Set." The tests were made with a 6 foot Lowe act, erected for experimental purposes, and following are some of the results showing operating conditions:

Coal per 1,000 as fired, lbs.	30.34
Fixed carbon per 1,000 from analysis, lbs.	24.42
Oil per 1,00 ft., gallons	3.84
Candle power of gas, candles	24.3
Candles per gallon of oil	6.33
Average length of blow, minutes	3.18
Average blast pressure, inches of water	21.5
Actual length of runs, minutes	3.93
Steam per 1,000. pounds	32.8

The temperature observed during these tests were as follows:

Carburetter base	1270°	Fah.
Superheater base	1290°	"
Superheater top	1280°	"
Outlet washbox	187°	"
Outlet exhauster	156°	"
Inlet condenser	155°	"
Outlet condenser	107°	"
Inlet tar extractor	106°	"
Inlet purifier	93°	"
Outlet purifier	88°	"
Outlet station meter	84°	"
Atmosphere	75°	"

It is hoped that this meager outline of a great industry will serve to stimulate a further study of the subject, as an understanding of the refinements of operation in the manufacture of carburetted water gas is a necessary part of a gas engineer's equipment.

Pacific Service Magazine

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Vol. IV MAY, 1913 No. 12

EDITORIAL

Spring is upon us now in all its effulgent glory, and before its sunny smile the snows in the high Sierras are rapidly melting away.

It is a welcome sight to all interested in "Pacific Service", for it means that the long period of enforced inactivity is at an end and that at every point along the line of our big construction work, from Lake Spaulding down, gangs of men are spreading over the landscape speeding developments, whose completion will mark an epoch in the life's history of our organization.

Up at Lake Spauding the foundation that was laid last fall at the site of what is to be the largest dam in the world has successfully stood the test of winter, and now the construction work has begun in earnest and concrete is being poured into the big dam at the rate of 1,000 yards a day. It will be necessary to keep on pouring, too, for it is estimated that more than 200,000 yards will be required. Gravel is being shipped from Colfax and Wadsworth, while two big Portland cement companies of the Coast, the Standard and Pacific, are kept busy supplying cement.

Work on the Drum Power House down the valley from Spaulding has been resumed. Concrete is being poured into the retaining wall at the back of the power-house. Pipe for the penstocks is being shipped and men are on the field to start work as soon as it arrives. Horses and equipment are being delivered for the work at the forebay. The machinery for the power plant is well under way, and intelligence has been received that one of the big generators under construction in the East has already been tested.

The developments below Drum, those at Clipper Gap and Auburn, respectively, are receiving attention, and men are actively at work on the ditches and tunnels.

Work on the new sub-station at Cordelia is being prosecuted with energy. The transmission line, also, is under full headway and in capable hands.

All along the line, then, the signs of activity are full of the promise which the Spring brings. It is joyous news indeed, not only to the administration but also to the rank and file of "Pacific Service", for it means that we are taking time by the forelock and that long before the great Universal Exposition throws its gates open to the public in 1915 the Pacific Gas & Electric Company will stand well at the head of the list of public service enterprises that will be able to answer "Ready!" when the public calls.

Henry L. Doherty & Company, the New York Bankers and operators of gas and electric enterprises, have recently published a number of charts showing, first, that in point of increase this class of securities outstanding has completely outstripped those of steam railroads and "industrials" during the past ten years; second, that the same may be said of their net earnings in bulk, and also per $100 dollars of securities outstanding.

These charts are the result of original research work undertaken by the Doherty company's statistical department. The groups comprise gas and electric companies in most of the large cities in the United States, all the steam railroads in the United States and all large "industrials" listed on the New York Stock Exchange, the figures for which were available as far back as 1902. Taking, first, railroad securities, it is found that there has been an increase in these during the last ten years amounting to 54%; but that while their net earnings have been fairly steady, they have not averaged above 4¼%. The large industrials show an increase of securities outstanding amounting to less than 20%, while their average net earnings for the ten years have been .79% per annum. The chart, however, shows violent fluctuation in these net earnings ranging from a minimum of 5% to a maximum of nearly 10%.

There has been a remarkably steadiness in the net earnings of the gas and electric companies. During the ten years they have never dropped below 8% on the securities issued, in spite of the fact that these latter have increased by 110%, or more than doubled the railroad expansion. But what, perhaps, is of still greater interest to investors is a fourth chart showing the average annual amounts of securities in receivers' hands per $100 of outstanding securities. This chart is the result of research work covering a period of thirty years from 1882 to 1911, inclusive, and involving over $545,000,000,000 of capital, in which figures are included all the gas and electric light companies in the United States, all the steam railroads and all the "industrials" large enough to obtain mention in the financial papers and manuals. The "industrials" stand at the head of the receivership risk column with an average of $2.07 per $100 of outstanding securities; the railroads come next with $1.84, while the gas and electric companies stand at the astonishingly low figure of 37c.

No wonder our attention is called almost daily to articles in the financial journals setting forth the rapidly increasing value of public utility securities in the eyes of the investing public.

A local newspaper makes mention of a recent lecture before the members of the Institute of Chemistry at the University of London on the subject of gas and electric consumption. The lecturer produced figures purporting to reveal the estimated annual consumption of gas per head of population in the world's chief capital cities, which figures showed London at the head of the list with a trifle over 8,000 cubic feet per capita, Amsterdam, Berlin, New York and Paris each averaging about 6,000 cubic feet.

We in San Francisco are able to beat these figures. The records of our Gas Department show that the per capita consumption in San Francisco for 1912, based upon an estimated population of 450,000, was 8,800 cubic feet. Surely, then, we are more than keeping pace with the larger cities of the world in gas consumption.

The present issue is the last of Volume IV and, as was done with the previous volumes, each District and Division will be supplied with a copy, bound in buckrum, for the office library.

Those having all copies of Volume IV, or any previous volume, in good condition, may have them bound in the same manner by forwarding them, charges prepaid, to the Stationery Department, on or before June 15th.

The charge for binding will be 60 cents. If the book is to be delivered outside of the Company's offices or stations in San Francisco there will be an additional charge of 26 cents to cover postage.

Collection will be made upon delivery of the bound copy.

Packages containing magazines should be addressed:

STATIONERY DEPARTMENT,
PACIFIC GAS AND ELECTRIC CO.
445 Sutter St., San Francisco.

Name of sender with full and complete address must be plainly marked on each package.

No magazines will be accepted after June 15.

ITEMS OF GENERAL INTEREST

Mr. F. G. Baum, Chief Engineer of our Hydro-Electric Department, passed the first week in May in the vicinity of Lake Spaulding where he superintended resumption of activities upon the big dam. The report he brought back with him was more than encouraging; it was enthusiastic to a degree.

"Our ordinary construction work stood the test of winter splendidly, and when weather conditions warranted our renewing work everything was in fine shape," he said. "We are now pouring concrete into the dam as fast as we can handle it, and we expect to average more than 1,000 yards a day from now on. The dam already stands 43 feet above the river bottom, and by means of a tunnel through it we have the water from the stream in full control. We'll pour in at least 200,000 yards of concrete this year and, maybe, we'll do better than that."

(As a matter of fact, it is an open secret that our Mr. Baum's estimate of the work to be accomplished before winter descends again upon the Sierras is the ultra conservative, and that while he will not actually say so, he in his own mind hopes to see the big 305-foot dam a finished performance before the year is out.)

Mr. Baum reports, further, that the mile-long tunnel leading from the dam, work upon which was possible during the winter season, is practically completed. "There is just a little trimming to do," he says. The gangs of workmen operating from opposite ends met in the centre May 1st, and it is a remarkable circumstance that so accurate was the survey of the engineers that their calculations were not a sixteenth of an inch at fault. They hit the target plumb in the centre, so to speak, and the tunnel stands as a remarkably fine piece of construction work.

From Bear Valley the canal is more than half finished, and the steel for the Drum power-house is set up. Machinery will begin to arrive in thirty days. Besides, two of the projected additional developments down stream, Nos. 4 and 5, have been started, those at Christian Valley and Auburn, respectively. Two dams are in process of construction and two more will have been started by the time this issue of PACIFIC SERVICE MAGAZINE reaches its readers. Work upon four tunnels has been begun, and a canal is being dug from Clipper Gap to Auburn which, it is expected, will be completed by August 1st, two months earlier than scheduled. The development at Christian Valley will be 10,000 horse-power, operating under a 340-foot head, while that in Auburn ravine will be, approximately 17,000 horsepower, operating under a 520-foot head.

"Nothing that I see can stop us now," says Mr. Baum, with emphasis. "We have as fine an organization as could be got together anywhere. Every position is filled by a capable man. We'll have everything going full blast by May 15th. There can be no question of the outcome of our enterprise."

Mr. Baum announces these two appointments: Mr. W. O. Peterson to be Assistant Superintendent of the Drum development under Superintendent D. H. Duncanson; Mr. C. H. Richards to be Assistant Superintendent of developments 4 and 5, under Superintendent James Martin. Both these gentlemen were Division Engineers in the Los Angeles acqueduct construction work.

Our Chief Engineer Baum's enthusiastic view of the situation in the Sierra country is heartily endorsed by Mr. John A. Britton, V. P. and Gen. Mgr, who visited Lake Spaulding at the time work on the dam was renewed and saw things for himself. He said upon his return:

"It is the most wonderful sight imaginable. History is being written at Lake Spaulding. No one who has the opportunity should miss seeing our development work at its present stage."

From the President's office comes the announcement that dating from May 1st the Antioch district is to be abolished as a separate district and its territory divided up between the Solano and Contra Costa districts. The Rio Vista section will be returned to the Solano district, where it belonged before, while the southern section, taking in Antioch, Pittsburg and the surrounding country, is to be turned over to the Contra Costa district.

Manager J. E. Poingdestre of the Marysville district is taking a well-earned vacation and will visit the home of his boyhood in the Channel Islands. Mr. E. A. Weymouth of the Commercial Department will have charge of the Marysville district in his absence.

Here's a communication that speaks volumes for itself and the subject of which it treats. We can do with more of the same kind:

"De Sabla., Butte Co., Cal.

"Editor PACIFIC SERVICE MAGAZINE:

I wonder if you would care to read a few pages from De Sabla, the little Paradise of a big company. I found myself here one day early in April equipped for a school term in the forest near here. The first week was a strenuous one, as mud, rain, snow and logs across the trails made walking anything but delightful to one coming from paved streets and avenues of roses.

But now the storms have passed, the logs have been cut, barbed wire fences opened, the school-room stove furnished with a new pipe, the roads graded, rolled and put in good condition, and life at De Sabla has become a dream; an ideal environment; glorious sunsets, radiant skies and trees of indescribable grace and beauty. The sunsets across De Sabla lake are inspiring and Mr. Packard, the artist of the camp, finds leisure moments to make water-color sketches of boat rides, fleeing deer, glorious pines, cedars and firs.

Mr. Adams, the superintendent, is comfortably located here. H. Warner, the bookkeeper, has a cozy cottage and looks after the postoffice. Mrs. Warner is visiting in Los Angeles. Mr. Grant, the foreman, makes things pleasant, and Mr. and Mrs. Tom Irwin of the boarding-house are the right people in this lovely place. The woods here are full of fine people. The roads are good and autos from Oroville and Chico are frequent visitors. This is certainly an ideal summer resort, and if people knew how perfect this climate is and how abundant and pure the water is, there would have to be a lumber mill on the spot to furnish cottages. Mrs. Hupp, a pioneer of Butte County, has a lovely house near by and with her daughter, Mrs. Jennie Harding, dispenses hospitality.

But we did not start in for personals but just to say what peace, beauty, joy and happiness we found in teaching at the Nimshew District school, one mile from De Sabla, and how kind, obliging and courteous everyone was up here in the Sierras. Certainly, the Pacific Gas and Electric Company has made beauty and peace center around this lovely spot.

To find electric lights galore and order, system and good fellowship in a work so stupendous, speaks volumes for the great power that has been harnessed from these mountain streams to light and bless millions of inhabitants.

Should you find space for these lines, we will call again.

If one may compare climate to fabric, here, at De Sabla, the climate is like velvet and the bay counties like burlap.

ELIZA VEEDER DOW.

The regular monthly meeting of the Oakland "Pacific Service" Club was held at Lincoln Hall, Tuesday evening, April 29, 1913. There was the usual large gathering of employees from the Oakland, Berkeley, and Alameda county Districts in attendance.

The subject for the evening was an illustrated talk on small motors, the application and use of same on the farm, by Mr. E. P. Gibson, of the General Electric Company. The talk was very instructive and much interest was shown by the fellows from the Alameda county District. After the talk, questions were asked and a general discussion taken up. The remainder of the evening's program consisted of piano and vocal selections, by Mr. and Mrs. A. C. Donaldson, and Mr. and Mrs. W. H. Jones, assisted by Miss Jones. Refreshments were served later.

The Oakland Pacific Service Club boasts of a fine aggregation of ball players who, as yet, have not been defeated. They are open for games and are confident of winning the Pacific Gas and Electric Company pennant. The baseball team is arranging for a theatre party at the local Orpheum in the near future which promises to be a very successful affair.

The following contribution comes from Manager Frank Leach's best baseball expert on the Modern Athens side of the bay:

"With a whoop and a hurrah, Capt. Wilkinson and his bunch of Bear Cats from the Oakland 'Pacific Service' Club, opened the season with a 13-8 victory over the crack St. Mary's College team on St. Mary's home grounds, Saturday, April 5th.

"It as a slugfest from the start, fourteen safe hits going to our credit while Weber who was on the mound held St. Mary's down to half that number. The lineup was:

Weber, pitcher; Smith, shortstop; Martin, catcher; Wilkinson, 1st base; Dixon, 3d base; Stevens, center field; Britton, left field; Agnew, 2d base; Hines, right field.

	R.	H.	E.
P. G. & E.	13	14	3
St. Mary's	8	7	3

"Several other games across the bay are on schedule, but as yet the S. F. District who won the French dinner last year, has failed to take up our challenge. What's the trouble, boys? Get together, for its your treat this time."

It seems as though all the good things come from Oakland just now. Here's another:

Oakland Commandery No. 11
Knights Templar.

Oakland, Cal., April 23, 1913.

The Pacific Gas & Electric Co.,
San Francisco, Cal.

Gentlemen:

I desire to express on behalf of Oakland Commandery No. 11 Knights Templar, the gratitude and esteem felt towards the Pacific Gas and Electric Corporation and its President Mr. John A. Britton.

The invaluable and generous services rendered to the Knights Templar Conclave in Oakland, Cal., by your company and its officers cannot be overestimated. They were *ne plus ultra.*

The beautiful decorations and illuminations were designed by your officials, free of all charges. The unstinted supply of lamps and electric current donated to the Conclave and the high voltage maintained made the illuminations of unsurpassable beauty.

Our visitors, the citizens of Oakland, and the Sir Knights of Oakland Commandery No. 11 Knights Templar, without exception, uttered the highest possible encomiums upon the magnificent light and color effects.

The ample and unique supply of current for lighting up by day as well as by night demonstrated to everybody the great surplus supply at your disposal.

The cheerful, courteous and untiring assistance given to the Conclave Committee, over a period of months, by your Oakland manager, Mr. Frank Leach, Jr., and his assistant, Mr.

Walter Cohick, call for very special mention and recognition by Oakland Commandery. I am, gentlemen,

Very courteously yours,

Francis H. E. O'Donnell,

Commander, Oakland Commandery No. 11
Knights Templar.

Dan Cupid has been busy with "Pacific Service" this year. An event worthy of special notice was the wedding of Mr. "Jack" Varney, Superintendent of Substations at San Francisco, who espoused Mrs. Anna Vaughan, also of San Francisco.

The ceremony took place in March at Calistoga, where the bride's girlhood days were passed. Mr. Frank Varney, the groom's brother, was a prominent figure at the wedding.

In April, Mr. H. A. Filbert, Foreman of Cement Station, was united in the bonds of matrimony to Miss Margaret McDonough at Sacramento. Both bride and groom are graduates of the Sacramento High School, and it was there that the romance which culminated in their union had its beginning.

* * *

Our Company Section, N. E. L. A.

First Number of the Monthly Bulletin Makes its Appearance and Proves to be an Interesting and Instructive Publication

Just before the close of last month the first BULLETIN issued by the Pacific Gas and Electric Company Section of the National Electric Light Association made its appearance and was circulated among members of the Section.

It proved to be a publication both attractive and instructive. Its contents included a Foreword by Secretary Harry Bostwick, detailing the ends and purposes of the BULLETIN; an account of the proceedings at the last previous monthly meeting of the Section; a couple of pages of N. E. L. A. notes, in which the several hundred members of the Section were classified according to department; the first installment of a very interesting paper on "Locating Faults in an Underground Cable," by C. A. Gaines; an inspiriting song entitled "Hurrah, Hurrah for P. G. & E!" written by C. M. Converse, set to the music of "Marching Through Georgia" and sung at the March meeting by a sextette from the Oakland District; last but not least, the Question Box, which appears to be attracting such an immense amount of interest that it threatens to crowd the BULLETIN to a no inconsiderable extent.

If all the issues of this PACIFIC SERVICE BULLETIN are as good as the initial one, our Company Section that has been started in the metropolis of the West will receive unusual attention at N. E. L. A. headquarters in the East. As it is the officials of the National Association have already welcomed our Company Section and its labors in the heartiest terms.

Noting Progress of the World's Fair

Physical work upon the Panama-Pacific International Exposition is progressing rapidly. A vast army of workmen is now transforming the grounds, which extend from the foot of Van Ness Avenue to the limits of Golden Gate Park, a distance of 15,000 feet. Work on the Palace of Machinery is under way. The arched trusses are going up rapidly, and before long that important part of the immense structure will be completed.

Work on the high water system is about to be inaugurated. Material for this system has been ordered, and some sixteen-inch pipe is now on the ground ready to be installed. The work on the sanitary storm sewers for state and foreign sites is progressing rapidly.

Contractors are grading the Exposition site and are using 312 head of stock and equipment in the work.

Piles for the construction of the Ferry freight slip are being driven and the steel for the Ferry freight slip apron is now being prepared.

Work on the construction of the Palace of Education has started, and the grading of the site for the Automobile Building is nearly completed. The sewer in the main roadway of the Concession section has been completed. The grading of the sites for the Liberal Arts Building, Court of Honor, North Entrance to Court of Honor, and Fulton Basin, is now under way. The pile foundation of the Transportation Building is being installed.

The contract for the construction of the Food Products Building will be awarded within a few days by the Buildings and Grounds Committee. The contract for plumbing for the Food Products Building has been awarded. Plans and specifications for the Agricultural Building have been completed and bids received.

Mr. A. M. Hunt, one of the most prominent consulting engineers of the Pacific Coast, has been appointed Chief of the Department of Machinery of the Panama-Pacific International Exposition. Mr. Hunt has been in business in San Francisco since 1894. Prior to that time he was in the United States Navy, being identified with the Engineering Corps of that branch of the Service. As Chief of the Department of Machinery, Mr. Hunt has agreed to give his entire time for the period of six months to the organization of the Department. It is the hope of the Exposition management that his services will be eventually secured for the entire period of the Exposition.

California will have a State Building at the Panama-Pacific International Exposition. Governor Johnson in a recent interview said:

"The people of the City of San Francisco and the State of California have contributed ten millions of dollars to the Exposition and our people with a generosity unparalleled in the history of the expositions, have placed at the disposal of the Panama-Pacific Exposition those ten millions, and, in addition to that, every county of the State of California has levied a tax of six cents on each hundred dollars of assessed value of property for the Exposition. Of course, out of these various sums an appropriate State Building will be constructed.

"It is impossible out of the general fund of the State of California this session to appropriate, as was asked, an additional million. The reports that have been sent broadcast to the effect that the State has turned down the Exposition or didn't intend to exhibit, are wholly without foundation, and these reports arose solely from the circumstance that an additional million was not at this particular time appropriated."

The Exposition directorate entertained Secretary of State William Jennings Bryan during his recent visit to San Francisco. Our distinguished visitor expressed himself delighted with all he saw and pledged the hearty support of the national administration.

PACIFIC GAS AND ELECTRIC COMPANY

DIRECTORS

- F. B. Anderson
- Henry E. Bothin
- John A. Britton
- W. H. Crocker
- E. J. De Sabla, Jr.
- F. G. Drum
- John S. Drum
- D. H. Foote
- Wm. G. Henshaw
- A. F. Hockenbeamer
- Samuel Insull
- John Martin
- C. O. G. Miller
- Louis Sloss
- George K. Weeks

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John A. Britton	Vice-Pres. and Gen. Mgr.	J. C. Love	Asst. Treasurer
A. F. Hockenbeamer	2d Vice-Pres., Treas. and Comp.	Charles L. Barrett	Asst. Secretary

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R. J. Cantrell	Property Agent	E. C. Jones	Engr. Gas Dept.
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F. S. Myrtle	Manager Publicity Dept.	P. M. Downing	Engr. O. & M. Hyd.-Elec. Sect.
L. H. Newbert	Manager Appliance Dept.	C. J. Wilson	Asst. Engr. Electric Distribution
J. J. Valentine	Superintendent of Transportation	F. H. Varney	Engr. O. & M. Steam & Gas Eng. Sect
G. C. Holberton	Chief Engineer Stockton Water Dist.	F. G. Baum	Chief Engineer Hydro-Electric Department

DISTRICT MANAGERS

District	Headquarters	Manager	District	Headquarters	Manager
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Berkeley			Petaluma	Petaluma	H. Weber
Oakland			Placer	East Auburn	H. M. Cooper
Chico	Chico	H. B. Heryford	Redwood	Redwood City	E. W. Florence
Colusa	Colusa	L. H. Hartsock	Sacramento	Sacramento	C. W. McKillip
Contra Costa	Martinez	Don C. Ray	San Francisco	San Francisco	G. C. Holberton
Fresno	Fresno	M. L. Neely	San Jose	San Jose	J. D. Kuster
Grass Valley	Grass Valley	John Werry	Santa Rosa	Santa Rosa	M. G. Hall
Marysville	Marysville	J. E. Poingdestre	Solano	Dixon	C. E. Sedgwick
Marin	San Rafael	W. H. Foster	Stanislaus	Newman	W. A. Widenmann
Napa	Napa	O. E. Clark	Vallejo	Vallejo	A. J. Stephens
Woodland	Woodland	W. E. Osborn			

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Nevada (Nevada City)	George Scarfe	Standard (Electra)	W. E. Eskew
Stockton (Stockton)	J. W. Hall		

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De Sabla	I. B. Adams	Sacramento	J. O. Tobey
Electra	W. E. Eskew	San Jose	J. O. Hansen
Marysville	E. C. Johnson	South Tower	A. H. Burnett
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J. W. Varney	Supt. of Sub-Stations, San Francisco		

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Marin	Chas. Dallerup	San Jose	A. C. Ramstad
Valley District (Chico, Marysville, Woodland and Colusa)	W. F. Blide		

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San Jose	R. H. Hargreaves		

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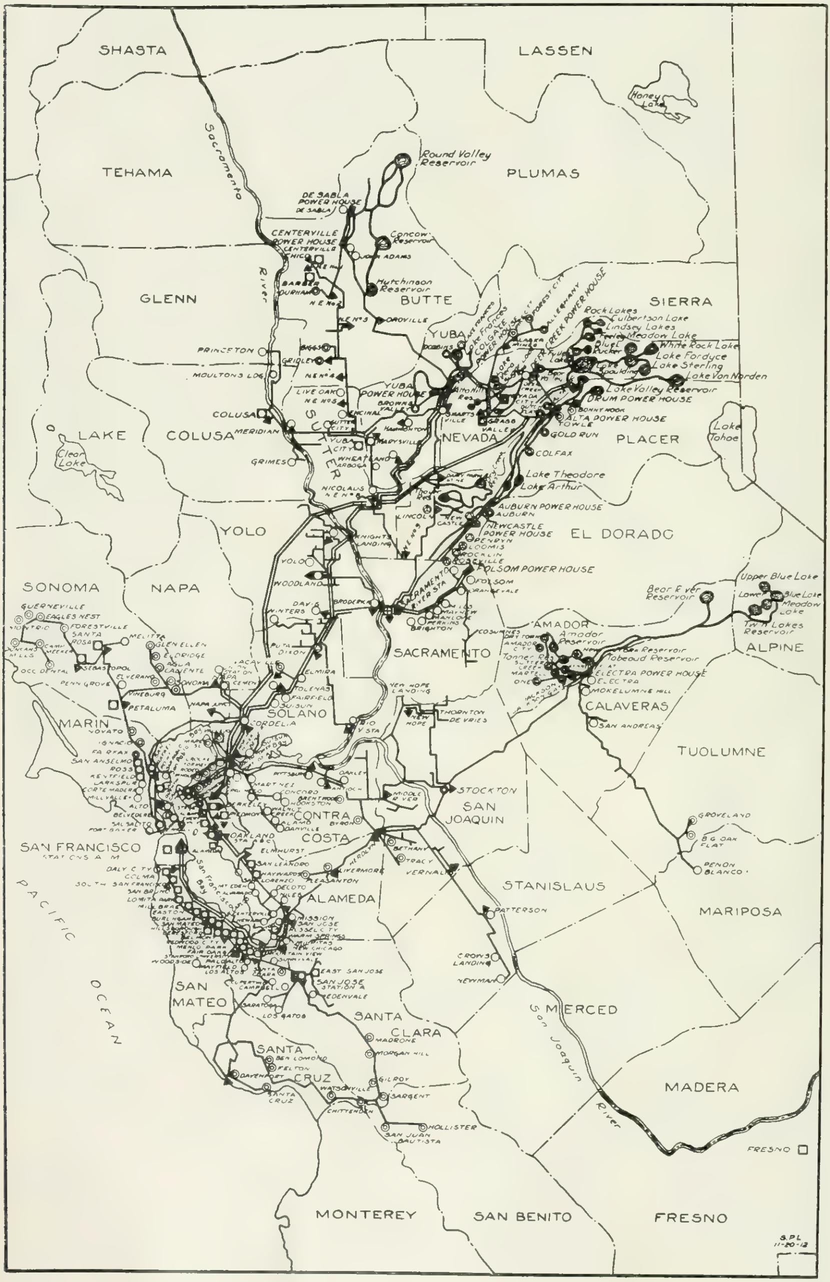
Oakland	George Kirk	San Francisco	D. E. Keppelma
Superintendent of Railway Department	N. J. Hullin		


SHASTA
LASSEN
Honey Lake
TEHAMA
Sacramento River
Round Valley Reservoir
PLUMAS
DE SABLA POWER HOUSE
CENTERVILLE POWER HOUSE
Concow Reservoir
Hutchinson Reservoir
GLENN
BUTTE
OROVILLE
SIERRA
YUBA
COLGATE POWER HOUSE
Lake Frances
Rock Lakes
Culbertson Lake
Lindsey Lakes
Meadow Lake
White Rock Lake
Lake Fordyce
Lake Sterling
Lake Van Norden
Lake Spaulding
Lake Valley Reservoir
DRUM POWER HOUSE
ALTA POWER HOUSE
YUBA POWER HOUSE
PRINCETON
MOULTONS LDG
COLUSA
MERIDIAN
LAKE
Clear Lake
COLUSA
SUTTER
GRIMES
YUBA CITY
MARYSVILLE
NEVADA
PLACER
Lake Tahoe
COLFAX
GOLD RUN
Lake Theodore
Lake Arthur
AUBURN POWER HOUSE
AUBURN
NEWCASTLE POWER HOUSE
EL DORADO
YOLO
LINCOLN
ROCKLIN
ROSEVILLE
FOLSOM POWER HOUSE
FOLSOM
SACRAMENTO RIVER STA
WOODLAND
DAVIS
WINTERS
SONOMA
NAPA
Upper Blue Lake
Lower Blue Lake
Meadow Lake
Twin Lakes Reservoir
Bear River Reservoir
AMADOR
Amador Reservoir
Tobeaud Reservoir
ELECTRA POWER HOUSE
ELECTRA
MOKELUMNE HILL
ALPINE
SACRAMENTO
GUERNEVILLE
SANTA ROSA
SEBASTOPOL
GLEN ELLEN
SONOMA
PETALUMA
VINEBURG
NAPA JCT
DIXON
ELMIRA
FAIRFIELD
SUISUN
SOLANO
CORDELIA
RIO VISTA
NEW HOPE
THORNTON
CALAVERAS
SAN ANDREAS
TUOLUMNE
MARIN
NOVATO
SAN RAFAEL
SAN ANSELMO
ROSS
KENTFIELD
LARKSPUR
CORTE MADERA
MILL VALLEY
SAUSALITO
PITTSBURG
ANTIOCH
MARTINEZ
CONCORD
BERKELEY
OAKLAND
CONTRA COSTA
BYRON
STOCKTON
SAN JOAQUIN
SAN FRANCISCO
STATIONS A M
DALY CITY
COLMA
SOUTH SAN FRANCISCO
SAN BRUNO
SAN LEANDRO
HAYWARDS
LIVERMORE
PLEASANTON
ALAMEDA
TRACY
VERNALIS
GROVELAND
BIG OAK FLAT
PENON BLANCO
STANISLAUS
PATTERSON
MARIPOSA
PACIFIC OCEAN
BURLINGAME
SAN MATEO
REDWOOD CITY
MENLO PARK
PALO ALTO
NILES
MISSION SAN JOSE
MOUNTAIN VIEW
SUNNYVALE
SANTA CLARA
EAST SAN JOSE
SAN JOSE STATION A
EDENVALE
LOS GATOS
SARATOGA
CAMPBELL
SAN MATEO
CROWS LANDING
NEWMAN
SANTA CLARA
MERCED
MADRONE
MORGAN HILL
SANTA CRUZ
BEN LOMOND
FELTON
DAVENPORT
GILROY
SARGENT
WATSONVILLE
CHITTENDEN
HOLLISTER
SAN JUAN BAUTISTA
San Joaquin River
MADERA
FRESNO
MONTEREY
SAN BENITO
FRESNO
S.P.L. 11-20-13

PACIFIC GAS AND ELECTRIC COMPANY

CITIES AND TOWNS SUPPLIED WITH GAS, ELECTRICITY, WATER AND RAILWAY

Service Furnished	Number of Towns	Total Population
Electricity	209	1,082,992
Gas	50	978,167
Water	25	52,865
Railway	1	60,000

Place	Population
Alta	20
[1] Alameda	25,000
Alamo	50
[2] Albany	800
[5] Amador City	200
Adams John	25
Alleghany	200
Alto	25
Angel Island	280
[5] Auburn	2,375
Agua Caliente	100
Alvarado	900
Antioch	3,000
Arboga	100
[2] Barber	500
[2] Belmont	350
Ben Lomond	800
Belvedere	1,000
Benicia	3,360
[2] Beresford	25
[2] Berkeley	40,000
Biggs	750
Big Oak Flat	20
Brentwood	200
Brighton	100
Broderick	200
[5] Brown's Valley	50
Byron	200
[2] Burlingame	4,000
California City	25
Camp Meeker	200
Campbell	600
Centerville	1,000
Centerville	20
[2] Chico	13,000
[2] Colma	3,500
[2] Colusa	1,500
Concord	1,500
Cement	1,500
[5] Colfax	500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Cupertino	50
Daly City	250
Danville	250
Davis	750
Decoto	350
de Sabla	25
[5] Dixon	1,000
[5] Dobbins	50
Davenport	1,000
[5] Drytown	20
Durham	500
[5] Dutch Flat	500
Duncan's Mills	150
[2] Easton	300
[2] East San Jose	1,660
Eagle's Nest	50
Edenvale	500
Eldridge	500
Elmira	150
El Verano	400
Electra	50
[2] Emeryville	5,000
Encinal	100
Fairfax	500
Fairfield	834
Forestville	100
Felton	300
[1] Fresno	30,000
[2] Fair Oaks	250
Folsom	1,800
Gilroy	2,000
Glen Ellen	500
[5] Gold Run	100
[3] Grass Valley	4,500
Gridley	1,800
Grimes	250
Groveland	125
Guerneville	500
Hammonton	500
[2] Hayward	4,000
[2] Hillsborough	1,000
Hollister	3,000
Hookston	75
Ignacio	100
[5] Ione	900
Irvington	1,000
[5] Jackson Gate	100
[5] Jackson	2,035
[5] Kennedy Flat	20
[2] Kentfield	250
Knight's Landing	350
[5] Lake Francis	5
Lathrop	300
Live Oak	200
Livermore	2,250
Los Gatos	3,000
Larkspur	600
[5] Lincoln	1,400
[2] Lomita Park	100
Los Altos	500
[5] Loomis	400
Maletta	30
Manlove	50
Martinez	5,000
[5] Martell	150
[2] Marysville	7,000
Mayfield	1,500
Mayhew	50
[2] Menlo Park	1,500
Meridian	300
[2] Millbrae	300
Mills	50
Milpitas	300
Mill Valley	2,500
Mission San Jose	500
Mokelumne Hill	150
Monte Rio	50
Moulton's Landing	30
Mountain View	2,500
Mt. Eden	200
Mare Island	500
[2] Napa	7,000
[3] Nevada City	2,700
[5] New Chicago	10
Newark	700
[5] Newcastle	750
Newman	1,000
Niles	800
Nicolaus	75
Novato	250
[2] Oakland	230,000
Oakley	80
Orange Vale	100
[2] Palo Alto	6,300
Pacheco	200
Penryn	250
Patterson	300
Penn Grove	300
Perkins	50
[2] Petaluma	5,500
[2] Piedmont	1,720
Pike City	200
Pinole	1,500
Pittsburg	2,372
Pleasanton	2,000
Point San Pedro	20
Port Costa	600
[2] Redwood City	3,200
[2] Richmond	10,000
Rio Vista	884
[5] Rocklin	1,000
[5] Roseville	2,600
Rodeo	500
[2] Ross	500
Russel City	250
[4] Sacramento	60,000
San Andreas	200
[2] San Anselmo	1,500
[2] San Bruno	1,500
[2] San Carlos	100
[2] San Francisco	416,912
[2] San Jose	30,000
[2] San Leandro	4,000
San Lorenzo	100
[2] San Mateo	6,500
[2] San Quentin	2,500
[2] San Rafael	6,000
San Pablo	1,000
Santa Clara	6,000
Santa Cruz	16,000
Saratoga	50
[2] Santa Rosa	12,000
[2] Sebastopol	1,200
Sausalito	2,500
Smartsville	500
[2] South San Francisco	2,500
[2] Stanford University	2,600
Sonoma	1,200
Stege	1,000
[5] Stockton	30,000
Suisun	1,200
Sutter City	150
Sutter Creek	1,500
Sunnyvale	1,500
Tiburon	400
Tormey	20
Towle	100
Tracy	1,200
Union Station	40
Vacaville	1,200
[2] Vallejo	15,000
Vineburg	200
Walnut Creek	350
Warm Springs	200
Watsonville	4,500
Wheatland	1,400
Winters	1,200
[2] Woodland	3,200
Woodside	200
Yolo	400
[2] Yuba City	1,200
Total	1,137,992

Unmarked—Electricity only.
1—Gas only.
2—Gas and Electricity.
3—Gas, Electricity and Water.
4—Gas, Electricity and Street Railways.
5—Electricity and Water.

EMPLOYS 4,800 people.
OPERATES 11 hydro-electric plants in the mountains.
5 steam-driven electric plants in big cities.
16 gas works.

SERVES ⅔ of California's population.
30 of California's 58 counties.
An area of 37,775 square miles.
⅗ the size of New York State.
½ the size of all the New England States combined.

You have heard of HARDY!

There are some who have not.

Because they have not asked.

That is the ONLY reason.

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